YOGA FOR VETERANS WITH POST-TRAUMATIC STRESS DISORDER

A DISSERTATION SUBMITTED TO THE GRADUATE DIVISION OF THE UNIVERSITY OF HAWAI`I AT MĀNOA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PUBLIC HEALTH

MAY 2017

By
Robin E. Cushing

Dissertation Committee:
Kathryn Braun, Chairperson
Alan Katz
Deborah Goebert
Wei Zhang
Kristine Qureshi

Keywords: Post traumatic stress disorder (PTSD), yoga, mind-body therapy, veterans

ACKNOWLEDGEMENTS

I would like to thank the following organizations and individuals:

To **Dr. Kathryn Braun** for her continued guidance and mentorship. She has been supportive even while I was deployed to Afghanistan. She guided me through the dissertation process and supported me emotionally through some rough times.

To my husband - **Richard**, for always supporting me in my journey. He has been my rock and has been the nucleus to our family.

To my two, boys **Levi** and **Hunter**, for making life adventurous and silly.

To my **dissertation committee** for their input, guidance, and support.

To the Veteran Service Organizations: **Warriors At Ease**, **Team Red, White, and Blue**, **Meghan's Foundation**, **Wounded Warrior Project**, & **Mission Continues**.

To **Lieutenant Colonel Jaimie Leonard-Highland**, we did not know each other, but our paths crossed on June 8, 2013. This pivotal moment changed the direction of my life which opened me up to mind-body therapies.

ABSTRACT

Studies have determined that approximately 15% to 20% of military service members are returning from deployment with Post-Traumatic Stress Disorder (PTSD) symptoms. The Department of Defense (DoD) and the Veterans Health Administration (VHA) have spent billions on post-9/11 veterans. However, many service members and veterans do not seek treatment due to the stigma of seeking care, side effects of treatment, or fear that a record of treatment will harm their professional military careers. These same individuals look for alternative options, such as mind-body therapies, to help in treating their PTSD symptoms.

This dissertation research was comprised of three studies (papers) to address several research questions exploring the usefulness of mind-body therapies on reducing PTSD symptoms in the military. The first study was a systematic literature review looking at the effect of mind-body therapies on combat veterans and service members suffering from PTSD (Study 1). The major finding of the systematic review was that mind-body therapies are promising therapies for reducing PTSD symptoms in veterans and service members. The second study was single-group pre-posttest study testing a military-tailored, trauma-sensitive yoga intervention with veterans suffering from PTSD (Study 2). I recruited 18 veterans with PTSD symptoms to participate in a 6-week intervention of 60-minute, weekly yoga classes. I compared their baseline and post-intervention responses on scales measuring PTSD symptoms as a primary measure and depression, anxiety, insomnia, and mindfulness as secondary measures. The participants demonstrated significant reductions in PTSD symptoms and all of the secondary measures. For Study 3, I conducted interviews with 9 veterans to explore their perceptions of the benefits and barriers to practicing a trauma-sensitive yoga. While Study 2 demonstrated that yoga can yield statistically significant improvements in wellbeing, study 3 provided me a deeper understanding of individual's perspectives of why veterans continue to practice or not practice yoga.

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CHAPTER 1

Post-traumatic Stress Disorder (PTSD) can occur when people are exposed to a stressful, traumatic experienced such as an event that threatens their life or their family or friends (Kucmin, Kucmin, Nogalski, Sojczuk, & Jojczuk, 2016). There are many different symptoms of PTSD that usually are described in four clusters: a) intrusive symptoms (flashbacks of the traumatic event as in nightmares), b) avoidance symptoms (avoiding activities that might remind you of the event), c) hyperarousal symptoms (insomnia, road rage, difficulties in attention or concentration), and d) negative changes (negative feelings towards people you love) ("Symptoms of PTSD - PTSD," n.d.). PTSD is a serious psychiatric disorder causing emotional, mental, behavioral, and physiological disturbances.

The prevalence of PTSD among members of the US Armed Forces engaged in recent military operations in the Middle East appears high. Studies have reported that PTSD diagnoses among veterans increased from 0.2% in 2001 to 21.8% in 2009 (Shiner, 2011). In fact, PTSD has become a common term in the military domain and has been labeled as one of leading injuries that military soldiers are sustaining from combat, with as many as 24% being diagnosed from current deployments (Wilk et al., 2013). PTSD has been linked to many other serious health outcomes, including suicide (Ramchand, Rudavsky, Grant, Tanielian, & Jaycox, 2015). Thus, PTSD and its associated negative alterations in cognition, moods, and arousal are leading public health concerns for the Department of Defense (DoD) and the Veterans Affairs (VA), and both agencies are supporting research, programs, and services to treat PTSD and subthreshold PTSD.

Current treatments of PTSD symptoms include cognitive behavioral therapy (CBT) such as psychoeducation, stress management, and prolonged image exposure, or antidepressants such as serotonin reuptake inhibitors (SRIs) (Committee on the Assessment of Ongoing Effects in the Treatment of Posttraumatic Stress Disorder & Institute of Medicine, 2012). Unfortunately, there are many barriers that are preventing service members from seeking these treatments. Two studies conducted by Hoge et al. (Hoge et al., 2004, 2008) suggest that only 23% to 40% service members who return from combat with mental health concerns will actually seek out care. Barriers that prevent military soldiers from seeking mental health care include self-stigma (such as feelings of shame), public stigma, and stigma from a service member's unit (Stecker, Shiner, Watts, Jones, & Conner, 2013). Other patient barriers include concerns over future employment effects from

seeking PTSD treatment. Per Army Regulation 40-501, some of the current PTSD treatments involve placing soldiers on a limited duty profile, which could further impact military medical readiness. With the high rate of mental health issues associated with the post 911 conflicts, including Operation Iraqi Freedom, Operation Enduring Freedom and Operation New Dawn (OIF/OEF/OND) deployment, it is vital to increase treatment options for military soldiers that will allow their continued duty, and these treatment options need to be portable and acceptable to service members.

The military is of special interest to me, due to my employment as an Army Physician Assistant and seeing the complexities of clinical care in treating soldiers with PTSD. I realize there is a need service members and veterans with PTSD symptoms that do not want to take psychotropic medications or seek care through behavioral health channels. In my own clinical experience, I worked with many soldiers unwilling to start PTSD treatment due to potential risks of hurting their careers or because of potential adverse effects of the medication. The prevalence of PTSD and its comorbidities in the military makes it crucial to evaluate other treatment options.

In 2012, a large study was conducted looking at complementary and alternative medicine (CAM) in the VA system (Libby, Pilver, & Desai, 2012). CAM refers to a group of health care treatments or practices that are not considered to be part of conventional medicine. Of the 125 completed surveys, more than 50% of individuals suffering from PTSD symptoms used CAM in the past year, and as many as 76% nonusers of CAM said they would use CAM if the treatments were offered to them at a VA facility. Clinical experience and community attitudes are encouraging a more natural and holistic approach to treating PTSD. Yoga has been a useful tool to decrease PTSD and depression in victims from the 2004 South-East Asia tsunami (Descilo et al., 2010).

A literature review conducted in October 2014 (Study 1) found that mind-body therapies are a possible solution for veteran's suffering from PTSD symptoms. Research testing the impact of mind-body therapies, such as focused breathing and meditation, suggest that these therapies reduce PTSD symptoms and may be attractive to veterans unwilling to seek out traditional behavioral or pharmaceutical health therapies. Even though the literature review showed promising results, the majority of the studies included small populations of OIF/OEF/OND veterans.

Also, none of the studies tested the effect of Hatha yoga on PTSD symptoms. Hatha yoga is physical, involving body postures and poses as well as focused breathing. Hatha yoga has been effective in reducing symptoms in civilians suffering from PTSD from non-military sources, such as

natural disaster or sexual assault (Thordardottir, Gudmundsdottir, Zoëga, Valdimarsdottir, & Gudmundsdottir, 2014). Hatha yoga has been tailored for the military by the Meghan's Foundation (Shortt, Maureen, Shortt, Thom, & Thompson, Liz, n.d.). The testing of one form of military-tailored yoga, conducted in Afghanistan, was found to reduce anxiety among participating soldiers and has been recommended for proactive combat stress management; however, PTSD measures were not used in the evaluation of this program (Stoller, Greuel, Cimini, Fowler, & Koomar, 2012). A military-tailored Hatha yoga practice may be a more attractive form of mind-body therapy then the other forms of yoga and breath work because of Hatha yoga's similarities to aerobic exercise to improve cardiorespiratory function (Bijlani et al., 2005). A military job requires service members to be physically and mentally fit, and many Army units initiate physical activity first thing in the morning. Incorporating a Hatha yoga practice once weekly into service members' physical activity agenda may help decrease overall PTSD symptoms in a military unit.

There has been no test of a military-tailored yoga intervention in Hawai`i, which is home to more than 50,000 active military personnel and their dependents. Currently in Hawai'i, a charitable organization known as Meghan's Foundation, supports the offering of a military-tailored version of yoga to military personnel. The military-tailored yoga offered by Meghan's Foundation is informed by the trauma literature. Hatha postures are referred to in English, rather than in Sanskrit. Participants are instructed not to close their eyes, singing and chanting are avoided, and the instructor always asks permission to provide adjustments to postures. However, the effectiveness of this program in reducing PTSD symptoms is not known.

Also, in the future it may be beneficial to have yoga offered to service members through military services, such as the patient-centered medical home (PCMH), Wounded Warrior Detachments (WWD), Warrior Transition Units (WTU), Morale Welfare and Recreation (MWR), Army Community Service (ACS), as well as to VA and Vet Centers. In response to the growing PTSD numbers in the US, the National Defense Authorization Act for 2010 required the Secretary of the Department of Defense (DoD) along with the Secretary of the Department of Veterans Affairs (VA) to commission an Institute of Medicine (IOM) study to assess PTSD treatment services in DoD and VA. Findings from the IOM report suggest that the current treatments are crisis-driven, with a focus on inpatient care instead of outpatient care ("Treatment for Posttraumatic Stress Disorder in Military and Veteran Populations," n.d.). With PTSD being the third most common service disability, IOM recommends DoD and VA work together to develop evidence-

based prevention and treatment programs and to continue to document the patient's progress throughout their treatment.

Purpose

The purpose of this dissertation is to answer three research questions related to the development of PTSD in the current OIF/OEF/OND population, the potential for Hatha yoga to help reduce PTSD symptoms in this population, and the potential for broader use of Hatha yoga in the US Army.

Research Questions

1. What mind-body therapies have been effective in reducing PTSD symptoms in OIF/OEF/OND veterans? *(Chapter 2)*
2. Does a military-tailored yoga intervention help alleviate PTSD symptoms in OIF/OEF/OND veterans in Hawai`i? *(Chapter 3)*
3. What motivators, benefits, and barriers of participating military-tailored yoga are perceived by veterans? *(Chapter 4)*

Research question one (Q1) will be examined by conducting a systematic literature review of PubMed and PsychINFO. Parameters will be set to only look for mind-body therapies that have been tested with veterans from OIF/OEF/OND and measured PTSD symptoms as a primary outcome. The therapies must be portable and self-taught.

Research question two (Q2) will allow me to determine if a trauma-sensitive Hatha yoga intervention tailored to a military population can help alleviate PTSD symptoms in veterans. I will administer a six-week intervention of once weekly yoga classes to veterans suffering from PTSD. I will collect self-reported data on PTSD and compare data from baseline and at 6 weeks.

The third question (Q3) will employ qualitative methods to explore motivators, benefits, and barriers of participating in a military-tailored yoga program. Given the exploratory nature of the interviews, codes will be developed both inductively and deductively. I will interview participants who finished the intervention as well as participants who did not complete the intervention. I hope to gain insights on how to increase receptiveness to yoga among service members and veterans.

The conceptual model is based on triangulation (*Figure 1.1*). This involves using different methods of collecting data to understand and interpret the phenomenon (Carter, Bryant-Lukosius,

DiCenso, Blythe, & Neville, 2014). Using triangulation can bring different insights to the phenomenon by exploring the research questions using different lenses.

The first angle in the triangle is to identify what mind-body therapies have been studied to reduce PTSD symptoms in a military population (Study 1). Through this literature review, I also will gain information on how to evaluate mind-body therapies for PTSD, which will inform the design my own research testing the effectiveness of a military-tailored yoga intervention with OIE/OIF/OND service members and veterans in Hawai`i (Study 2). The third angle represents the qualitative study designed to further our understanding of perceived benefits, barriers, and cues to action needed to attract and retain soldiers and veterans in a military-tailored yoga intervention (Study 3).

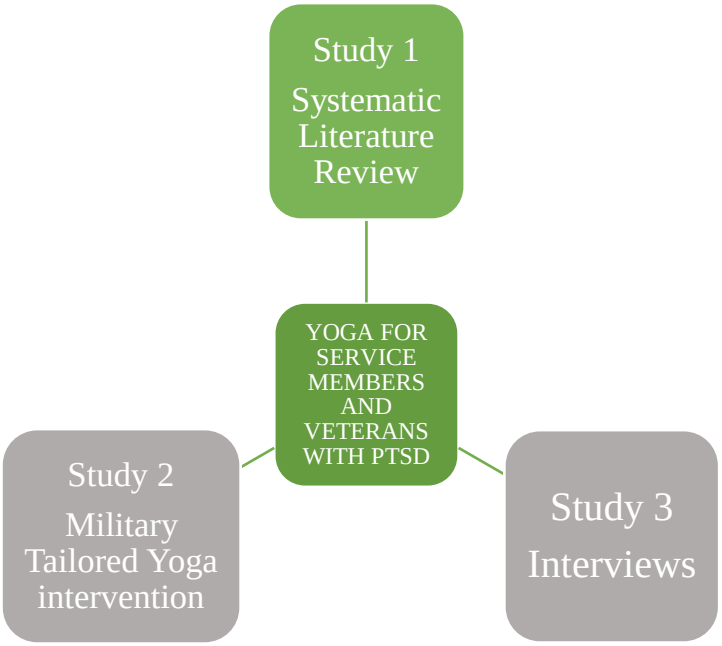


Figure 1.1. Triangulation Method for dissertation research

Community Partners

Several partners will be involved in answering research question 2 and question 3. Meghan's Foundation is an organization that offers free yoga classes to veterans suffering from PTSD. This foundation developed a yoga protocol that is military-sensitive and trauma-sensitive. I am an instructor of this version of Hatha yoga and a volunteer with Meghan's Foundation. Another organization is the Hawai`i chapter of Team Red White and Blue (Team RWB), with over 1500 members. I am an Athletic Coordinator and yoga coordinator for this organization as well, so I am

able to offer military-tailored yoga to their members. Many of the Team RWB members are affiliated with the military and may suffer from PTSD symptoms. The third community partner is Warriors At Ease. This nonprofit organization teaches yoga instructors how to teach a trauma-sensitive yoga class. My goal is to bridge these organizations to offer yoga classes to veterans suffering from PTSD and test the effects of this intervention. After the yoga intervention, I will evaluate motivators and perceptions of yoga and barriers to yoga practice.

CHAPTER 2

Mind-Body Therapy for Military Veterans with Posttraumatic Stress Disorder Symptoms: A Systematic Review

Abstract

After the bombing of the World Trade Towers in 2001, the United States has sent more than 2.5 million troops to Afghanistan in Operation Enduring Freedom (OEF) and to Iraq in Operation Iraqi Freedom (OIF) and Operation New Dawn (OND). About one third report combat-related mental health conditions, but only 23% to 40% of service members who return with mental health complaints seek medical care. Mind-body therapies have been offered as alternative approaches to decreasing Post Traumatic Stress Disorder (PTSD), but no review of studies with OEF, OIF, or OND veterans was found. A systematic literature review was conducted following the Preferred Items for Systematic Reviews and Meta-Analyses guidelines. Of 175 records identified in PubMED and PscINFO, 15 met the inclusion criteria. Studies reported on seated or gentle yoga that included breath work, meditation, mantra repetition, or breathing exercises. Overall, studies reported significant improvements in PTSD symptoms in participants in these interventions. Although each study included OEF, OIF, and OND veterans, about 85% of participants were from other conflicts, predominantly Vietnam. Future studies are needed to evaluate the impact of mind-body therapies on larger samples of OEF, OIF, and OND veterans.

Keywords: military, veterans, mind-body, PTSD

Introduction

The prevalence of Post-Traumatic Stress Disorder (PTSD), a serious psychiatric disorder causing emotional, mental, behavioral, and physiological disturbances, appears to be increasing among service members participating in military operations in the Middle East. Studies have reported that PTSD diagnoses among veterans increased from 0.2% in 2001 to 21.8% in 2009 ("Health Services Use in the Department of Veterans Affairs among Returning Iraq War and Afghan War Veterans with PTSD - v22n2.pdf," n.d.). In fact, PTSD has become a common term in the military domain and has been labeled as one of the leading injuries that military soldiers are sustaining from combat, with as many as 24% being diagnosed from current deployments (Wilk et al., 2013).

There have been many reports documenting the effects of war on psychological health of the soldier. During the Civil War, soldiers with PTSD-like symptoms were diagnosed with "effort syndrome," "irritable heart," or "soldier's heart" (Birmes, Hatton, Brunet, & Schmitt, 2003). In World War I, soldiers suffering from tremors, fatigue, ticks, and memory loss were diagnosed with the mental condition called shell shock (Jones, 2006). With the Vietnam War, researchers documented many veterans suffering from chronic psychological problems and termed this condition "combat fatigue" (Medicine, 2007). A recent survey examining PTSD among Vietnam war veterans estimated lifetime PTSD prevalence of 31% for male veterans and 26% for female veterans of this war (Schlenger et al., 2007). This survey brought to light the invisible wounds that PTSD can cause and resulted in greater appreciation of PTSD as a mental health disorder. Many of these Vietnam veterans continue to suffer from alcohol abuse, high rates of unemployment, and intimate partner violence (Savarese, Suvak, King, & King, 2001).

After the terrorist attacks on New York City on September 11, 2001, the United States (US) responded by sending troops to Afghanistan as part of Operation Enduring Freedom (OEF) and to Iraq as part of Operation Iraqi Freedom (OIF) and Operation New Dawn (OND). As of 2014, more than 2.5 million US soldiers have deployed to these Middle East countries (http://www.nato.int/cps/en/natohq/topics_69366.htm). A study conducted with more than 100,000 OIF/OEF veterans demonstrated that one-third received care for at least one mental health condition, and 13% had the diagnosis of PTSD (Seal, Bertenthal, Miner, Sen, & Marmar, 2007).

The Diagnostic and Statistical Manual of Mental Disorders (DSM IV) states the diagnosis criteria for Posttraumatic Stress Disorder (PTSD), which includes a history of exposure to a

traumatic event and the portrayal of symptoms from each of three clusters: re-experiencing symptoms (for example traumatic nightmares and flashbacks), hyperarousal symptoms (for example feeling irritable and having an exaggerated startle response), and avoidance symptoms (for example feeling numb and feeling depressed). To be diagnosed with full PTSD, a soldier would have to have at least one symptom in the re-experience cluster, two or more symptoms in the hyperarousal cluster, and three or more symptoms in the persistent avoidance cluster. Subthreshold PTSD or partial PTSD describes a veteran who has troubling PTSD symptoms but does not meet the full criteria of PTSD diagnosis. Individuals with PTSD or subthreshold PTSD will tend to experience dissociative symptoms (for example feeling that things don't appear real or that something is not happening). For the military soldier in war situations, horrific combat events are common occurrences, and these can trigger symptoms of PTSD.

A leading public health concern for the Department of Defense (DoD) and the Veterans Affairs (VA) is the high prevalence of combat-related PTSD, with its associated negative alterations in cognitions and moods and arousal. Both agencies are supporting research, programs, and services to treat PTSD and subthreshold PTSD. Current treatments of PTSD symptoms include cognitive behavioral therapy (CBT) such as psychoeducation, stress management, prolonged image exposure, and antidepressants such as serotonin reuptake inhibitors (SRIs) (Committee on the Assessment of Ongoing Effects in the Treatment of Posttraumatic Stress Disorder & Institute of Medicine, 2012).

Unfortunately, there are many barriers that are preventing service members from seeking these treatments. A study published in 2004 suggests that only 23% to 40% service members who return with mental health complaints will actually seek out care (Hoge et al., 2004). Barriers that prevent military soldiers from seeking mental health care include self-stigma (such as feelings of shame), public stigma, and stigma from a service member's unit (Stecker, Shiner, Watts, Jones, & Conner, 2013). Others worry that seeking PTSD treatment will negatively affect promotion or future employment options. Per Army Regulation 40-501, some of the current PTSD treatments involve placing soldiers on a limiting-duty profile, which could further impact military medical readiness. With the high rate of mental health issues associated with OIF/OEF/OND deployment, it is vital to increase treatment options for military soldiers that will allow their continued duty, and these treatment options need to be portable and acceptable to service members.

In response to an anonymous survey distributed to military outpatient clinics in 2004, 72% of 291 respondents reported using a form of complementary and alternative medicine (CAM) to

treat pain, stress, and anxiety (McPherson & Schwenka, 2004). Mind-body therapies and other CAM therapies are increasing in popularity as an alternative or adjunct treatment for soldiers suffering from mental health conditions. Many mind-body therapies are moveable, invisible, do not require any special equipment, and are non-toxic. These advantages may help soldiers who do not want to seek out traditional PTSD treatments.

The literature suggests that a type of mind-body therapy known as mindfulness-based stress reduction (MBSR) is effective in reducing stress, depression, and anxiety (Praissman, 2008). However, to our knowledge, there are currently no reviews to determine if mind-body therapies can decrease PTSD symptoms in veterans. Therefore, the purpose of this systematic review is to summarize literature testing the effect of mind-body therapies in decreasing PTSD symptoms in veterans of OIF/OEF/OND.

Methods

This literature review was guided by the Preferred Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA) (McLeroy, Northridge, Balcazar, Greenberg, & Landers, 2012). The search was conducted in September 2016 through PubMed/MEDLINE and PsycInfo. PubMed MeSH terms were used to capture articles reporting on the military population (veteran and veterans) with mental health disorders who received a portable mind-body intervention for PTSD (mindfulness, mind-body therapy, and yoga).

The PICOS (participants, interventions, comparisons, outcomes, and study design) framework was used to set article inclusion criteria. In terms of participants, studies must have included participants from OIF/OEF/OND deployments regardless of age or sex. Authors were asked by email to provide information regarding the war the veterans participated in if this was not included in the article. Studies were included if participants were a mixed group of war veterans, as long as some OIF/OEF/OND veterans were included. Also, participants must have had a diagnosis of PTSD or subthreshold PTSD. The PTSD symptoms or diagnosis must have been from combat, rather than from another event, such as sexual trauma or natural disaster.

In terms of intervention, articles had to evaluate mind-body therapies, including mindfulness programs such as mindfulness-based stress reduction (MBSR), mind-body bridging (MBB), meditation, and yoga. These forms of interventions are considered as CAM or integrative medicine

and can be utilized by individuals at home or on deployment. Studies that included veterans receiving behavioral or pharmacological care in addition to a mind-body therapy were not excluded.

In terms of study designs and outcomes, due to the limited literature in this area, studies using experimental, quasi-experimental, and single-group designs were included as long as they reported findings from a PTSD-related outcome measure taken prior to and following the intervention (primary outcome measure). Studies also may have reported changes in depression, anxiety, sleep quality, and compassion (secondary outcome measures). The following studies were excluded from the review: studies with no participants from OIF/OEF/OND, observational studies, studies on mind-body therapy interventions that were not portable, and studies reported in languages other than English.

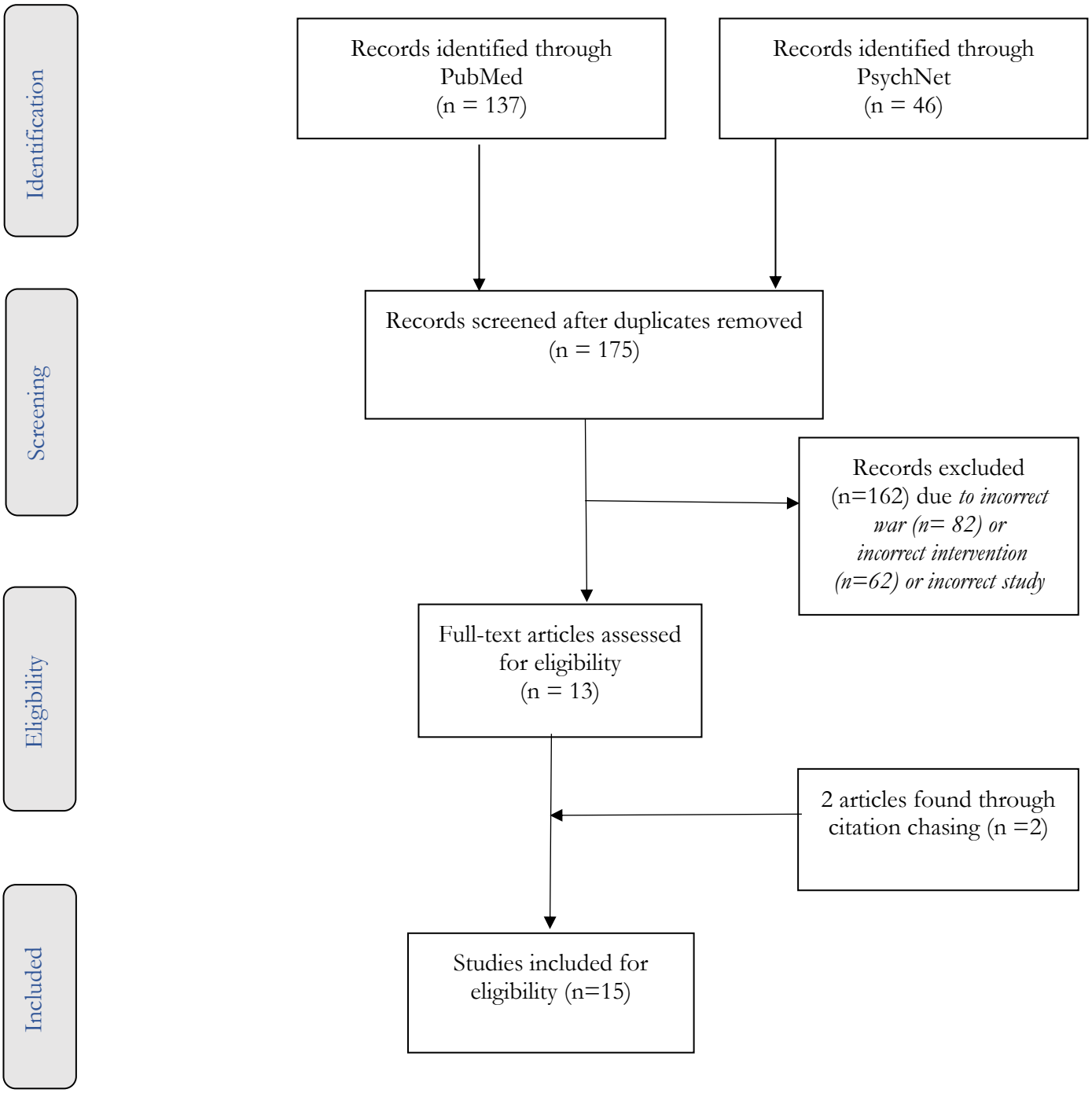
After the search was completed, titles and abstract were reviewed, and inclusion/exclusion criteria were applied. Citation information, study population, intervention, duration of follow-up, measurements and outcomes were abstracted from the studies. Data abstracted about the participants included mean age, the percentage of males, and the percentage of OIF/OEF/OND veterans. Allowance of co-intervention, such as concurrent behavioral health therapy, was annotated if stated in the article. The intervention description, length, frequency, and duration were abstracted, as well as study outcomes. Outcome measures were grouped by PTSD measures (primary outcome), measures of traumatic events, secondary outcomes (e.g., depression, insomnia, anger, compassion), and laboratory findings. Timing of data collection and changes in baseline and post-intervention values were noted.

To establish methodological quality of each study, the internal and external validity was examined using the Critical Appraisal Skills Programme (CASP) tool ("Critical Appraisal Skills Programme (CASP)," n.d.). This tool, which is publicly obtainable and used in systematic reviews, applies 11 specific questions when appraising controlled-design studies, and was adapted for single-group studies by applying 7 or the 11 questions. Each is answered as "yes," "no," or "can't tell." For the purpose of this systematic review, each question that was given a "yes" response was given one point. Even though the CASP does not assign a score, this adaption was made for this systematic review. Therefor the highest score for a RCT study is a score of 11 and the highest score for a single-group is a score of 7.

Results

From PubMed and PsycINFO, 175 articles were found once duplicates were removed (Figure 1). After reviewing titles and abstracts, 62 articles were excluded because they reported on unrelated interventions, 82 articles were excluded because they targeted veterans from other wars, and 17 articles were excluded because the study was observational or the publication was an editorial. The remaining thirteen articles were read in full, and two additional articles were identified through citation chasing. Thus, fifteen articles were included in the review. All fifteen studies investigated mind-body therapy, such as meditation, yoga, and mindfulness, as an intervention and assessed PTSD in at least some OIF/OEF/OND veterans.

Figure 2.1. PRISMA Flow chart of results of literature review



Shown in *Table 2.1*, tests of seven different mind-body interventions were reported in the fifteen articles. Mindfulness-based stress reduction (MBSR) was the subject of five articles (Bhatnagar et al., 2013; Cole et al., 2015a; Kearney, McDermott, et al., 2013; Kearney et al., 2011; Polusny et al., 2015), as well as three more articles that adapted portions of the MBSR intervention (Niles et al., 2012; Possemato et al., 2016; Wahbeh, Goodrich, Goy, & Oken, 2016).

The mantram repetition program (MRP) was the subject of two articles (Bormann, Thorp, Wetherell, Golshan, & Lang, 2013a; Bormann, Thorp, Wetherell, & Golshan, 2008). Yoga was examined in two articles, including a style called Krishnamacharya Healing and Yoga Foundation (KHYF) yoga (Staples et al., 2013) and a style of yoga called Sudarshan Kriya Yoga (SKY) (Seppala et al., 2014). Meditation was examined in two articles, including one on loving-kindness meditation (LKM, Kearney, Malte, et al., 2013) and one on transcendental meditation or TM (Rosenthal et al., 2011). The final article reported on the testing of a mind-body bridging (MBB) intervention (Nakamura, Lipschitz, Landward, Kuhn, & West, 2011).

The most common intervention was MBSR, with five of the studies testing this type of intervention and three testing portions of this intervention. The MBSR course was developed by Jon Kabat-Zinn at the University of Massachusetts Medical School and is conducted over 8 weeks with an additional all-day retreat. The aim of this program is to teach participants to attend to the present moment in a nonjudgmental way. Components of MBSR include mindful meditation, gentle yoga, and slow breathing. MBSR was originally developed to help people with chronic pain. Systematic reviews have demonstrated that MBSR may be helpful in alleviating chronic pain and alleviating mental health disorders (Chiesa & Serretti, 2011; Hofmann, Sawyer, Witt, & Oh, 2010).

A recent study demonstrated that participants of 8 weeks of MBSR showed positive improvement in their psychological well-being and in the gray matter density within their brains (Singleton et al., 2014)

Three of the articles tested adaptations of MBSR (Cole et al., 2015; Possemato et al., 2016; Wahbeh et al., 2016). Wahbeh et al.randomized participants to four arms: mindful meditation (MM), slow breathing (SB), mindful meditation plus slow breathing (MM+SB), and a "sitting quietly" group as an inactive control. Possemato et al. evaluated a condensed MBSR program known as Brief Mindfulness Training (BMT), with four weekly, 90-minute sessions. Niles et. al. conducted MBSR using telehealth.

The two studies of the Mantra Repetition Program (MRP) were conducted by a research team led by Jill Bormann. MRP is a portable intervention that teaches mindfulness by repeating a word or a phrase called a mantram (Bormann et al., 2013). The mantram is silently repeated throughout the day, bringing attention and awareness to the individual. The MRP intervention helps individuals to concentrate on one thing, also known as one-point attention, and has been shown to decrease breathing rate and blood pressure (Bernardi et al., 2001). Another aim of MRP is to help individuals slow down by acting with a purpose.

The two different yoga interventions—KHYF and SKY—were tested; these are specific types of yoga that focus on breathing. KHYF-style yoga links breath to movement and teaches a specific meditative focus (Staples et al., 2013). The SKY method uses different breathing rates that are separated by normal breathing. Studies speculate that SKY helps with releasing prolactin, vasopressin, and oxytocin, which are important hormones that have been found to lower depression and in regulating the hypothalamic-pituitary-adrenal (HPA) axis (Zope & Zope, 2013).

Loving-kindness meditation (LKM) is a style of meditation that aims to enhance feelings of kindness and unselfish compassion to self and others. Studies demonstrated that LKM may enhance the frontal lobe of the brain that is involved in emotional processing and empathy (Hofmann, Grossman, & Hinton, 2011). The other form of meditation, called TM, involves two 20-minute mediation sessions a day in a seated position. This is a mantra meditation that over time can decrease sympathetic drive, blood pressure, and stress reactivity (Travis et al., 2009) and may protect against chronic stress. Long-term use of TM has demonstrated decrease in cortisol level and in cortisol response to stress (McLeroy et al., 2012).

One article tested an intervention called mind-body bridging (MBB). Similarly to MBSR, MBB trains participants to use awareness or present moment to help regulate their mental and physical state (Begley, 2007). MBB aims to help veterans recognize and become aware of ruminating thoughts and impaired mental or physical functioning.

Of the fifteen studies, only two targeted OIF/OEF/OND veterans exclusively—the test of SKY yoga and TM both recruited veterans from the Iraq and Afghanistan conflicts (Table I). The mean ages of these samples were 28 years and 30 years, respectively, and 100% were male. Four studies said they included OIF/OEF/OND veterans in their samples, but did not specify a percentage, but mean ages of the samples ranged from 46 to 54 years (Bormann et al., 2008; Cole et al., 2015; Kearney, Malte, et al., 2013; Nakamura et al., 2011). In the other nine studies,

OIF/OEF/OND veterans comprised as low as 3% to as high as 42% of the sample; the mean ages of these samples ranged from to 51 to 62 years (suggesting that most were Vietnam era veterans) , and between 75% and 100% were male.

Table 2.2 displays the results of the studies' quality scores. Nine articles reported results of a controlled test of the intervention; eight used a randomized controlled trial design (Bormann, Thorp, Wetherell, Golshan, & Lang, 2013b; Bormann et al., 2008; Kearney, McDermott, Malte, Martinez, & Simpson, 2013; Nakamura et al., 2011; Niles et al., 2012; Polusny et al., 2015a; Possemato et al., 2016; Seppälä et al., 2014a; Wahbeh et al., 2016), and one used a quasi-experimental design (Niles et al., 2012). The other six studies used a single-group, pre-posttest design (Bhatnagar et al., 2013; Cole et al., 2015; Kearney, Malte, et al., 2013; Kearney, McDermott, Malte, Martinez, & Simpson, 2012a; Rosenthal, Grosswald, Ross, & Rosenthal, 2011; Staples, Hamilton, & Uddo, 2013). Quality scores for the nine controlled studies ranged from a low of 8.5 to a high of 10.5 out of 11. Quality scores for the six non-controlled studies ranged from 3 to 7 out of 7. Overall, studies most commonly lost points for not presenting a precise treatment effect estimate, having a low treatment effect, and not blinding participants/personnel.

Table 2.3 details the study characteristics of the RCTs and shows short-term outcomes for the primary measure of PTSD and commonly measured secondary outcomes. The scales used were the PTSD Checklist Civilian (PCL-C), PTSD Checklist Military (PCL-M), and Clinician-Administered PTSD Scale (CAPS). The eight RCTs used the PTSD Checklist (PCL), which is a brief self-report screening instrument to assess intervention ("PTSD Checklist for DSM-5 (PCL-5) - PTSD: National Center for PTSD," n.d.). The PCL focuses on the three main clusters of PTSD symptoms: re-experiencing of the trauma, avoidance or numbing, and hyperarousal. All eight RCTs targeted veterans with a verified PTSD diagnosis, and sample sizes ranged from 21 to 146. Of the eight RCTs, only one showed no improvement in any of the PCL symptoms right after the intervention (Kearney, McDermott, et al., 2013), one showed improvements only in hyperarousal symptoms (Bormann et al., 2013), and one showed significant improvement in both hyperarousal and re-experiencing symptoms (Seppala et al., 2014). The remaining five studies did not break down the PTSD clusters, but stated that they found significant improvements in the PTSD symptoms (Bormann et al., 2008; Nakamura et al., 2011; Polusny et al., 2015a; Possemato et al., 2016; Wahbeh et al., 2016). The article by Wahbeh et al., which tested different components of MBSR, showed decreases in PTSD symptoms in the mindfulness meditation (MM) arm, the mindfulness meditation

plus with slow breathing (MM+SB) arm, and "sitting quietly" arm, but there was no decrease in PTSD symptoms in the slow breathing (SB) arm (Wahbeh et al., 2016).

Table 2.1. **Interventions and Study Design**

Intervention	Reference	Mean age, % male, % OIF/OEF/ OND	Concurrent tx OK	Study design	Intervention sample, frequency, duration	Control	Follow-up from baseline
Mindfulness-Based Stress Reduction (MBSR)	#1 Kearney et al., 2013	52 yrs, 75% males 14% OIF/OEF/OND	Yes	RCT	N = 25, Once/wk @150 min for 8 wks, plus 1 full day retreat	N=22 Usual tx	8 wks 6 mos
	#2 Bhatnagar et al., 2013	60 yrs, 88% males 13% OIF/OEF/OND	Not reported	Single group	N = 8, Once/wk @150 min for 8 weeks		8 wks 3 mos
	#3 Kearney et al., 2011	51 yrs, 75% males 14% OIF/OEF/OND	Yes	Single group	N=92, Once/wk @150 min for 8 weeks, plus 1 day retreat		8 wks 6 mos
	#4 Polusny et al., 2015	59 yrs, 84% male 10% OIF/OEF/OND	Yes	RCT	N=58, Once/wk@150 min for 8 wks, plus 1 day retreat	N=58, Present-centered therapy	3, 6, 9 wks 4.25 mos
	# 5 Cole et al., 2015	46 yrs, ?% males ?% OIF/OEF/OND	Yes	Single group	N=9, Once/wk @ 150 min for 8 weeks, plus 1 full day retreat		8 wks 4 1/2 mos
BMT adapted from MBSR	#6 Possemato et al., 2016	54 yrs, 87% male 42% OIF/OEF/OND	Yes	RCT	n=36, 4 sessions (one/week) for 90 min	N=26 Usual tx	4 wks 8 wks
Components of MBSR	#7 Wahbeh et al., 2016	52 yrs, 95% male 30% OIF/OEF/OND	Yes	RCT	N=27, Mindfulness meditation (MM) N=2, Slow Breathing (SB) N=25, MM+SB All: once/wk @20 min for 6 wks	N=25 Sitting quietly (SQ)	6 wks
MBSR by telehealth	#8 Niles et al., 2012	52 yrs, 100% male 30% OIF/OEF/OND	Yes	Quasi	N=17, 2 weekly sessions in-person, 6 by phone	N=16 Psychoeducation	8 wks 3.5 mos
Mantrum Repetition Program	#9 Bormann et al., 2008	56 yrs, ?% males ?% OIF/OEF/OND	Yes	RCT	N = 14, Once/wk @90 min for 6 wks	N=15 Delayed tx	6 wks
	#10 Bormann et al., 2013	57 yrs, 97% males 3% OIF/OEF/OND	Yes	RCT	N = 66, Once/wk @90 min for 6 weeks	N=70 Usual tx	6 wks
KHYF Yoga	#11 Staples et al., 2013	62 yrs, 83% males 16% OIF/OEF/OND	Not reported.	Single group	N=12, Twice/wk @60 min for 6 weeks		6 wks
SKY Yoga	#12 Seppala et al., 2014	28 yrs, 100% males 100% OIF/OEF/OND	Yes	RCT	N=11, SKY, once/day @180 min for 7 days	N=10 Delayed tx	1 mo 1 yr
Transendental Meditation	#13 Rosenthal et al., 2011	30 yrs, 100% males 100% OIF/OEF/OND	Yes	Single group	N = 5, 3 TM instruction @60-90 min; TM practice twice/day @20 min; instructor meetings twice/wk for 12 wks		8 wks
LK Meditation	#14 Kearney et al., 2013	54 year, 60% males ?% OIF/OEF/OND	Yes	Single group	N = 37, Once/wk @ 90 min for 12 wks		3 mos 6 mos
Mind-Body Bridging	#15 Nakamura et al., 2011	50 yrs, 95% male ? OIF/OEF/OND	Not reported.	RCT	N=35 2 sessions (one/week) for 90 min	N=28 Sleep hygiene	3 wks

Yr = year; Mos = months; wks = weeks, LK=Loving Kindness

Table 2.2. Study Quality Assessment

	Study design	Trial addressed clearly focused issue	Assignment of patients to treatments randomized	Patients, health workers and study personnel blinded	Groups similar at the start of the trial	Aside from the experimental intervention, groups treated equally	Entering patients accounted for at conclusion?	Good treatment effect size	Precise treatment effect estimate	Generalizability	All clinically important outcomes considered	Benefits worth harms and costs	Total Score
#2 Bhatnager et al., 2013	Single group	✓					✓					✓	3
#13 Rosenthal et al., 2011	Single group	✓					✓			✓	✓	✓	5
#11 Staples et al., 2013	Single group	✓					✓	✓	✓	✓	✓	✓	7
#14 Kearney et al., 2012	Single group	✓					✓	✓	✓	✓	✓	✓	7
#5 Cole et al., 2015	Single group	✓					✓	✓	✓	✓	✓	✓	7
#3 Kearney et al, 2011	Single group	✓					✓	✓	✓	✓	✓	✓	7
#7 Wahbeh et al., 2016	RCT	✓	✓	Partial ✓	✓	✓	✓			✓	✓	✓	8.5
#10 Bormann et al., 2013	RCT	✓	✓	Partial ✓	✓	✓	✓	✓			✓	✓	8.5
#15 Nakamura et al., 2011	RCT	✓	✓	Partial ✓	✓	✓	✓	✓		✓	✓	✓	9
#6 Possemato et al., 2016	RCT	✓	✓	Partial ✓	✓	✓	✓	✓		✓	✓	✓	9.5
#8 Niles et al., 2012	Quasi	✓	✓	Partial ✓	✓	✓	✓	✓		✓	✓	✓	9.5
#12 Seppala et al., 2014	RCT	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	10
#1 Kearney et al., 2013	RCT	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	10
#4 Polusny et al., 2015	RCT	✓	✓	Partial ✓	✓	✓	✓	✓	✓	✓	✓	✓	10.5
#9 Bormann et al., 2008	RCT	✓	✓	Partial ✓	✓	✓	✓	✓	✓	✓	✓	✓	10.5

Table 2.3. Outcomes

			PTSD				Secondary Outcomes			
Intervention	Reference	Study design	Measure	Reexp	Hyper-arousal	Avoid-ance	Depression	Anxiety	Sleep Quality	Mindfulness
Mindfulness-Based Stress Reduction (MBSR)	#1 Kearney et al., 2013	RCT	PCL-C	↑ (post-hoc only)			↔ PHQ-9			↑ FFMQ
	#2 Bhatnagar et al., 2013	Single group	CAPS	↑	↑	↑				
	#3 Kearney et al., 2011	Single group	PCL-C	↑	↑	↑	↑ PHQ-9			↔ FFMQ
	#4 Polusny et al., 2015	RCT	PCL & CAPS	↑ PCL & ↔ CAPS			↑ PHQ-9			↑ FFMQ
	#5 Cole et al., 2015	Single group	PCL-C	↑						
BMT adapted from MBSR	#6 Possemato et al., 2016	RCT	PCL-S & CAPS	↑ PCL & ↑ CAPS			↑ PHQ-9			↑ MAAS & FFMQ
Components of MBSR	#7 Wahbeh et al., 2016	RCT	PCL	↑ (MM, MM+SB, and SQ only)			↑ BDI (only MM)		↑ PSQI (only MM)	↑ FFMQ (MM & MM+SB)
MBSR by telehealth	#8 Niles et al., 2012	Quasi	PCL & CAPS	↑ PCL & ↑ CAPS (at post-treatment & ↔ PCL & ↔ CAPS at follow-up)						
Mantram Repetition Program	#9 Bormann et al., 2008	RCT	PCL & CAPS	↑ PCL & ↔ CAPS						↑ MAAS
	#10 Bormann et al., 2013	RCT	PCL & CAPS		↑		↑ BSI	↔ BSI		↑ FACIT-Sp
KHYF Yoga	#11 Staples et al., 2013	Single group	PCL-M	↔	↑	↔			↑ PSQI	
SKY Yoga	#12 Seppala et al., 2014	RCT	PCL-M	↑	↑	↔	↔ MASQ (GDD &AD)	↑ MASQ (GDA & AA)		
Transcendental Meditation	#13 Rosenthal et al., 2011	Single group	PCL-M& CAPS	↑			↑ BDI			
Loving-Kindness Meditation	#14 Kearney et al., 2013	Single group	PSS-I	↑			↑ PROMIS			↑ FFMQ
Mind-Body Bridging	#15 Nakamura et al., 2011	RCT	PCL-M	↑			↔ CES-D		↑ MOS-SS	↑ FFMQ

BDI = Beck Depression Inventory-2; BSI-18 = Brief Symptom Inventory-18; CES-D = Center for Epidemiological Studies Depression Scale; FACIT-Sp = Functional Assessment of Chronic Illness Therapy-Spiritual Well-being Scale; FFMQ = Five Facet Mindfulness Questionnaire; f/u = follow-up; MASQ = Mood and Anxiety Symptoms Questionnaire with 4 subscales: GDA = General Distress-Anxiety, AA = Anxious Arousal, GDD = General Distress-Depressive, & AD = Anhedonic Depression; MM = mindfulness meditation; MM + SB = mindfulness meditation and slow breathing; MAAS = Mindfulness Attention Awareness Scale; MOS-SS = Medical Outcomes Study-Sleep Scale; PCL-C = PTSD Checklist-Civilian; PCL-M = PTSD Checklist – Military; PCL-S = PTSD Checklist-Specific; PHQ-9 = Patient Health Questionnaire-9; PROMIS = Patient-Reported Outcomes Measurement Information System; PSQI = Pittsburgh Sleep Quality Index; PSS-1 = PTSD Symptom Scale Interview; SQ = sitting quietly; (↑) = symptoms improved and were statistically significant from baseline or from the control group, (↔) = symptoms improved but were not statistically significant or there was no difference between baseline numbers or the control group

As shown in *Table 2.3*, all six interventions tested with one-group, pre-post study designs demonstrated improvement in PTSD measures. Again, sample sizes were relatively small, from 5 to 92. The study of transcendental meditation (TM) demonstrated a reduction in PTSD symptoms by 50% at the 8-week mark (Rosenthal et al., 2011), while the studies of MBSR showed significant improvements in PTSD in all three clusters ((Bhatnagar et al., 2013; Kearney et al., 2012a). One of the four tests of MBSR used a single-group design with participants who, not only had PTSD symptoms but also suffered from mild traumatic brain injury. This study not only improved PTSD symptoms, but also improved attention immediately following MBSR and was sustained 3 months later (Cole et al., 2015). The test of MBB found PTSD improvement immediately following two weeks of treatment compared to the control group (Nakamura et al., 2011).

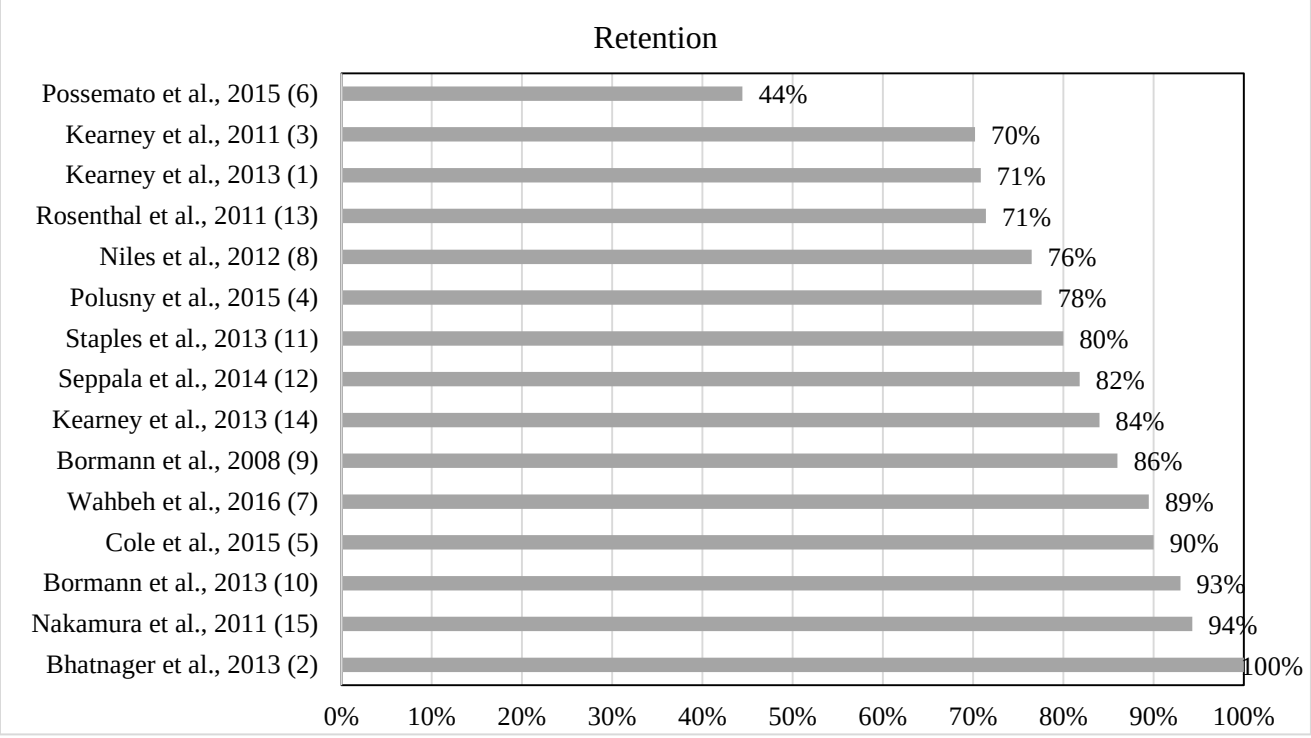
Depression, mindfulness, and insomnia were three common secondary outcome measures in many of the studies. The most common measurement used to screen for depression was the Patient-Health-Questionnaire (PHQ-9). The PHQ-9 is a self-administered screening instrument that incorporated DSM-IV depression criteria and is designed for use in health care settings (Kroenke, Spitzer, & Williams, 2001). Scores of 5, 10, 15, and 20 represent mild, moderate, moderately severe, and severe depression, respectively. Out of the fifteen studies, ten of the studies screened for depression, and four used the PHQ-9 form. Of the four studies that used PHQ-9, three of the studies showed improvement (Kearney et al., 2012; Polusny et al., 2015a; Possemato et al., 2016), with the fourth study showing no changes in depression score post intervention (Kearney, McDermott, et al., 2013).

Another common secondary measure was mindfulness, defined as paying attention to the present moment, including thoughts, emotions, and physical sensations, in a nonjudgmental way (Ludwig & Kabat-Zinn, 2008). This ancient Buddhism technique has been increasing in popularity as a way to help patients with various chronic conditions. Of the fifteen studies, nine studies measured mindfulness, with seven using the Five-Facet Mindfulness Questionnaire (FFMQ)--observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). Of the seven studies that used FFMQ (Kearney, Malte, et al., 2013; Kearney et al., 2012; Kearney, McDermott, et al., 2013; Nakamura et al., 2011; Polusny et al., 2015a; Possemato et al., 2016; Wahbeh et al., 2016) only one did not show any improvement in this measure (Kearney et al., 2012a).

Three of the studies evaluated insomnia. Sleep disturbances are a core clinical feature of PTSD. Two of the three PTSD clusters--hyperarousal and re-experiencing the traumatic event—reference sleep issues and nightmares, respectively (Lamarche & De Koninck, 2007). Two of the studies used the Pittsburgh Sleep Quality Index (PSQI) to assess seven components of sleep quality--sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). The mindfulness meditation arm of the study done by Dr. Wahbeh and the KHYF study both showed improvement in the PSQI scores (Staples et al., 2013; Wahbeh et al., 2016).

Study retention data are shown in Figure 2. Intervention and study completion rates ranged from 44% to 100%, and authors noted that compliance rates were higher than for conventional psychotherapy. The two studies exclusively targeting OIF/OEF/OND veterans both reported over 70% retention (Rosenthal et al., 2011; Seppälä et al., 2014).

Figure 2.2. Study Retention



Discussion

To the author's knowledge, this is the first systematic literature review examining the impact of mind-body interventions on OIF/OEF/OND veterans with PTSD. The evidence suggests that these interventions are effective because significant improvements were seen in PTSD measures between the intervention group and the control in the RCTs, and over time in the one-group, pre-post studies. PTSD hyperarousal symptoms were most commonly improved, while re-experiencing symptoms either stayed the same or were minimally improved. Thus in regards to the first research question, it appears that mind-body interventions are effective in reducing the severity of PTSD symptoms in this target population. Secondary outcomes demonstrated that mind-body interventions can also reduce depression and insomnia symptoms and increase mindfulness in veterans.

The evidence from participant retention suggest that these interventions are simple to learn and not onerous to maintain. They are designed to be practiced almost anywhere, eliminating stigma associated with going to a mental health clinic for treatment. Many of interventions can be portable (i.e., they do not require a special place to be conducted), and can be convenient (i.e., they can be done on deployment, at home, or on a work break). As previously stated, there are many service members and veterans who do not seek mental health treatment or drop out (Hoge et al., 2004; Stecker et al., 2013). These emerging interventions suggest innovative ways to address barriers to treatment and to help in reducing PTSD symptoms.

The reviewed mind-body therapies can be taught and delivered to a dozen or more veterans at the same time versus traditional PTSD treatments that are conducted with a single patient, including prolonged exposure (PE), cognitive processing therapy (CPT), and eye movement desensitization reprocessing (EMDR). Even though the articles did not discuss the cost of these interventions, many mentioned how they were cost-effective and easy to implement compared to traditional treatments for PTSD.

The review's primary limitation is the small number of current OIF/OEF/OND veterans in many of the studies. In fact, OIF/OEF/OND veterans comprised less than 20% of the participants in 8 of the 15 studies that were not 100% OIF/OEF/OND. Although treatment of Vietnam veterans also is important, combat-related traumatic events have shifted over time. The conflicts in

the Middle East involve insurgent attacks, suicide and car bombs, and improvised explosive devices. Another important factor is the age gap between Vietnam veterans and OIF/OEF/OND veterans; Vietnam veterans are now age 60 and older and have other physical ailments affecting their quality of life. One article discussed potential limitations of implementing their intervention with the current veteran era (OIF/OEF/OND). Reasons for not being able to recruit veterans from Iraq and Afghanistan were because classes were held during day, conflicting with employment or school, fear of stigma of having a PTSD diagnosis, and barrier of time to attend the classes (Bormann et al., 2008).

Another significant limitation is lack of control in the six single-group studies. The reported improvements in the measures could have been due to regression to the mean or the placebo effect (Rosenthal et al., 2011). All subjects in the studies were self-selected and knew about the study. Also out of the 15 quantitative studies, only six had more than 30 people in the intervention group. Many of the studies indicated that participants were able to continue other prescribed treatments, which may have explained improvements. Finally, only two studies had duration of follow-up past six months (Kearney et al., 2011; Seppala et al., 2014).

Conclusion

This systematic review found significant improvements in PTSD symptoms between the control and intervention group in the RCTs or between pre- and post-test in the single group design studies. However, further mind-body therapy studies are needed that include larger samples size of OIF/OEF/OND veterans and are conducted over longer periods of time.

CHAPTER 3

Military Tailored Yoga for Veterans with Post-Traumatic Stress Disorder

Abstract

Studies have reported that PTSD diagnoses among veterans increased from 0.2% in 2001 to 21.8% in 2009. There are many different PTSD treatments for veterans, but clinic- and pharmaceutical-based treatments are undersubscribed due to stigma and decreased duty readiness. Yoga has been shown to reduce PTSD symptoms in the civilian population, but few studies have tested the impact of yoga on veterans of post-9/11 conflicts with PTSD. The purpose of this study was to determine whether yoga might be helpful in reducing symptoms of PTSD in veterans from Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), or Operation New Dawn (OND). Veterans (n=18) participated in a 60-minute weekly yoga session for 6 weeks. The yoga sessions were based on trauma-sensitive Hatha-style yoga program of the Warriors at Ease Foundation and Meghan's Foundation. Eighteen OIF/OEF/OND veterans completed the pre- and post-intervention self-report questionnaires. There was significant improvement in the PTSD outcome scores (measured with the Post Traumatic Stress Disorder Checklist-Military), as well as improvements in the secondary measurements (depression, anxiety, sleep quality, and mindfulness). This study demonstrates that trauma sensitive yoga can be an effective therapy or adjunct treatment to Veterans with PTSD symptoms.

Keywords: PTSD, Yoga, veterans, combat, mindfulness

Introduction

Service members deployed to the Middle East in support of Operation Enduring Freedom, Operation Iraqi Freedom, and Operation New Dawn (OEF/OIF/OND) have a high risk of trauma exposure, such as being fired upon or seeing a friend die. As many as 20% of returning veterans are meeting criteria for posttraumatic stress disorder (PTSD) symptoms (Hoge et al., 2004). Additional studies also suggest that 17% to 20% of Vietnam combat veterans had or have PTSD (Goldberg et al., 2016; Magruder et al., 2015).

As described in the DSM-V, PTSD is a delayed and prolonged response to trauma exposure. It is characterized by three major clusters: persistent re-experiencing of the events, persistent avoidance of any stimuli that reminds them of the event, and hyperarousal symptoms such as nightmares (American Psychiatric Association, 2013). PTSD can cause emotional, mental, and behavioral disturbances that has been linked to increased suicide rates (Debeer, Kimbrel, Meyer, Gulliver, & Morissette, 2014).

People with PTSD suffer from heightened sympathetic activation, which increases their heart rate and blood pressure, slows digestive functioning, decreases blood flow to extremities, and increases stress hormones such as cortisol to prepare for fight or flight response. The high levels of sympathetic activation and disturbed hypothalamic-pituitary-adrenal (HPA) axis have also been linked to physiological disturbances such as arterial damage and coronary heart disease (CHD) (Kubzansky, Koenen, Spiro, Vokonas, & Sparrow, 2007).

Current treatments for PTSD include psychotherapy and/or pharmacological treatment. Popular pharmacological treatment includes selective serotonin-reuptake inhibitors (SSRI), selective serotonin-norepinephrine reuptake inhibitor (SNRI), and prazosin. Effective psychotherapies for PTSD include exposure-based therapies (ET), cognitive-based therapies (CT), and eye movement desensitization and reprocessing (EMDR)
http://www.healthquality.va.gov/guidelines/MH/ptsd/cpgPTSDFULL201011612c.pdf

Unfortunately, there are many barriers that prevent service members and veterans to seek out these treatments. Two studies conducted by Hoge and colleagues suggest that only 23% to 40% of service members who return from combat with mental health concerns will actually seek out care (Hoge et al., 2004; 2008). One study suggested four main reasons why service members do not seek out treatment for their symptoms. These barriers include concerns about treatment, emotional readiness for treatment, stigma associated with having a mental health condition, and logistical issues (Stecker et al., 2013).

Complementary and alternative medicine (CAM) is a group of practices or treatments that are not considered to be part of conventional medicine. A survey conducted in 2011 found that 50% of veterans in the VA use a form of CAM (Libby et al., 2012). The most common forms were mindfulness, stress management, progressive muscle relaxation, art therapy, yoga, and meditation. CAM treatments may be more acceptable than conventional treatment to veterans with PTSD, especially if one major barrier to traditional treatment is fear of being prescribed psychotropic medication. However, many CAM treatments are not standardized or manualized. For use with individuals with PTSD, CAM treatments may be improved by making them "trauma sensitive." Complementary practices are growing not only with the veteran communities, but also with the general population. A statistical report from National Center for Health Statistics compared yoga, tai chi, and qi gong for 2002, 2007, and 2012. The use of these three forms of mind-body therapies increased linearly over the three points from 5.8% in 2002 to 10.1% in 2012, with yoga being the most commonly used of the three forms ("National Health Statistics Reports Number 79 February 10, 2015 - nhsr079.pdf," n.d.)

Yoga may be beneficial to veterans and service members with PTSD by decreasing the hyperarousal symptom cluster by activating the parasympathetic system. The parasympathetic nervous system (PNS) is the rest-and-digest portion of the autonomic nervous system, and has important functions of decreasing the heart rate and blood pressure, speeding up digestive functioning, and normalizing stress hormones. Slow rhythmic breathing that is synched to body movements of yoga can help increase the PNS and help stimulate vagal activity (Papp, Lindfors, Storck, & Wändell, 2013). Studies have shown that yoga can reduce cortisol levels and be helpful in restoring the HPA balance (Gothe, Keswani, & McAuley, 2016).

Numerous yoga studies have demonstrated improvement in mental wellbeing, whether as an adjunct or primary treatment for multiple health conditions. Looking specifically at PTSD, there are several studies that show that trauma-informed yoga can help people suffering from PTSD, including women suffering PTSD following interpersonal violence (Clark et al., 2014; van der Kolk et al., 2014), children exposed to interpersonal trauma in urban settings (Beltran et al., 2016; Spinazzola, Rhodes, Emerson, Earle, &Monroe, 2011), and communities suffering from PTSD due to natural disasters (Descilo et al., 2010; Thordardottir et al., 2014).

A popular mind-body therapy that has been manualized and used with military veterans is Mind Body Stress Reduction (MBSR). The MBSR course was developed by Jon Kabat-Zinn at the University of Massachusetts Medical School and is conducted over 8 weeks with an additional all-

day retreat. The aim of this program is to teach participants to attend to the present moment in a nonjudgmental way. Components of MBSR include mindful meditation, gentle yoga, and slow breathing. A literature review in January 2016, found five studies of MBSR that reduced PTSD symptoms in veterans (Bhatnagar et al., 2013; Cole et al., 2015a; Kearney, McDermott, et al., 2013; Kearney et al., 2011; Polusny et al., 2015). Unfortunately, 85% or more of the participants in these MBSR studies were Vietnam veterans. Thus, it is unknown how well this works with OIF/OEF/OND veterans. There are many differences between Vietnam and OIF/OEF/OND veterans. For example, Iraq and Afghanistan veterans are younger, more likely to be female, more likely to be single, more often working, and less likely to be incarcerated (Fontana & Rosenheck, 2008).

Warriors at Ease (WAE) is a program developed by Robin Carnes, Molly Birkholm, Karen Soltes, and Col. Patricia Lillis, MD in 2008 that incorporates trauma- and combat-injury-sensitive practice, a military-culture-informed approach, and evidence-based practices ("Warriors at Ease - Health | Resiliency | Connection," n.d.). There are more than 725 teachers that work in military communities offering trauma-sensitive yoga to current veterans and service members. WAE instructors can be found in the Veteran Affairs, Vet Centers, and other veteran service organizations such as Team Red, White, and Blue, Meghan's Foundation, Wounded Warrior Project, and Veterans of Foreign Wars (VFW). These offerings, however, have not been tested for their effectiveness in reducing PTSD.

This study piloted trauma-sensitive, Hatha-style yoga program that was developed by Warriors at Ease and promoted by the Meghan's Foundation. Participants were located in Hawai`i and were OIF/OEF/OND veterans with PTSD. The aim of this study was to assess the impact on PTSD symptoms of yoga as an adjunct to usual care for Iraq and Afghanistan veterans with PTSD. It was hypothesized that the veterans with PTSD that completed this trauma-sensitive yoga intervention would show improvements in PTSD symptoms, depression, insomnia, anxiety, and mindfulness.

Methods

This study was approved by the Institutional Review Board (IRB) of the University of Hawaii. Written informed consent was obtained before enrollment in the study. There was no cost to participants for the yoga course. Meghan's Foundation provided yoga mats for participants to

use if they did not have their own mat for class. The yoga mats and yoga blocks were brought to each class by the instructor. A small incentive was provided.

Yoga Intervention

The yoga intervention for this study was taught by a certified yoga instructor trained in the trauma-sensitive Warriors at Ease protocol. The yoga intervention was designed to provide a Vinyasa-style yoga that is appropriate for a military setting to create a welcoming environment that can reduce PTSD triggers. Three key components of Vinyasa yoga are breath work, physical postures, and meditation. The Vinyasa style focuses on moving from pose to pose and coordinating with the breath. Yoga, with origins in ancient India, has multiple sub-types, with Vinyasa being just one of them. The Warriors at Ease and Meghan's Foundation protocol is trauma sensitive to allow the room to be a safe space for participants. This includes not assisting or adjusting of participants in yoga poses, avoiding vulnerable type positions such as happy baby, using the English language name for the yoga pose instead of the Sanskrit name, and allowing participants to close their eyes only if they were comfortable to do so.

Each session was very similar in sequence, starting with a 10-minute warmup inclusive of 3-5 minutes of meditation (*Table 3.1*). This seated meditation component refers to bringing a mindful awareness to internal cues (such as bodily sensations, breath, thoughts, and emotions) and external cues (such as sights and sounds in the room). The seated meditation is followed by 25 minutes of standing yoga, 10 minutes of balancing yoga, and 10 minutes of mat yoga. The last pose of yoga is known in Sanskrit as Savasna, which is translated as corpse pose. Since corpse pose is associated with death, this word was not used. In lieu of the word "corpse pose," the word "resting pose" was used.

Table 3.1. Yoga Sequence

Warmup 10 minutes
Relaxed yoga breathing in seated posture
Neck Stretch, wrists rotation and extension
Table Top → Cat/Cow stretch
Thread the Needle
Opposite Arm & Leg balance in table top
Sun Salutation A
Standing Yoga 25 minutes
Warrior 1
Warrior 2
Reverse Warrior
Extended Side Angle
Plank or modified plank
Triceps pushup *optional and can be on knees
Cobra or Upward Dog
Downward Dog *optional to use chair
Triangle Pose
Pyramid Pose
Balancing Yoga 10 minutes
Tree pose
Eagle & modified Eagle
Warrior 3
Extended Leg
Chair pose
***using Wall or Chair to help with balance
Mat Yoga 10 minutes
Hamstring stretch with strap
IT band stretch with strap
Boat and ½ Boat pose
Modified Bridge Pose
Resting Posture 5 minutes
Soft, relaxation breathing
Body Scanning meditation

Participants

Participants were recruited using Facebook social media A flyer advertising the study was uploaded to websites of veteran service organizations to include Wounded Warrior Project and Team RWB.. Eligible participants were veterans, who self-reported being deployed to Iraq or

Afghanistan in support of OIF, OEF, or OND. All participants were over 18 years of age. They must have had subthreshold or diagnostic-level PTSD related to their combat military service, as determined by a score of 30 or higher on the Post Traumatic Stress Disorder Checklist-Military version (PCL-M). Under the direction of the yoga instructor, subjects agreed to practice yoga once a week for 6 weeks. Excluded were individuals with noncombat-related PTSD, those unable to mentally or physically perform yoga, and/or those who were pregnant.

Yoga was conducted at the Oahu Veterans Center in Honolulu and a yoga studio, and participants were to attend once a week for at least 5 sessions in 7 weeks. Participants were not required to discontinue ongoing treatment with other mental health providers. Ongoing psychotherapy and behavioral health treatment was annotated before and after the study, as well as duration veterans were under current treatment plan. All the veterans were provided with further resources to include Military OneSource, Veterans Crisis Line, and information on services provided by the Vet Center.

Measures

Baseline data were collected from the participants, including gender, age, race/ethnicity, deployment history (OEF, OIF, and/or OND), branch of Military Service (Marine, Army, Navy, Airforce), marital and family status (single, married, divorced/separated, or widowed), education status (high school or equivalent, some college, bachelor's, graduate degree, or professional license), and current treatment for PTSD (e.g. psychotropic medications, cognitive therapy, nothing). The PCL-M was administered at pre-screening immediately after consent. Participants were also asked to complete four psycho-social questionnaires –the Patient Health Questionnaire (PHQ-8), the Beck Anxiety Inventory (BAI), the Pittsburgh Sleep Quality Index (PSQI), and the Mindful Attention Awareness Scale (MAAS).

The primary outcome measure was the PCL-M. The PCL-M is a 17-item questionnaire with Likert 5-point scale, from 1 (not at all) to 5 (extremely). This measure is used clinically to evaluate PTSD, especially among military personnel, and has shown to have good validity (Bliese et al., 2008; Hirschel & Schulenberg, 2010). Sample items ask about how often in the past month the respondent was bothered by physical reactions (example: heart pounding, sweating) when something reminded them of a stressful military experience from the past or were bothered by a loss of interest in things that you used to enjoy. The 17 PTSD symptoms are grouped into three clusters: five re-experiencing symptoms, seven avoidance symptoms, and five hyper-arousal symptoms. All items are summed to obtain a total severity score (the range of total possible scores is 17 to 85. A score of

44 is considered PTSD-positive for general population, while a score of 50 is considered a PTSD-positive in the military population. There are many different cutoff values, but for the purpose of this study, I used a cut-off of 30 or higher to qualify for the study. This score captures not only participants with full PTSD, but participants who may be suffering from partial PTSD symptoms (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996; Lang et al., 2006).

The PHQ-8 has been determined to be a valid instrument for identifying depression in the general population (Kiely & Butterworth, 2015). It includes 8 items scored using a Likert scale from 0 (not at all) to a 3 (nearly every day). Sample items include: "how often in the last two weeks have you been bothered by little interest or pleasure in doing things" or "bothered by poor appetite or overeating." Item scores are totaled, and the range of possible scores is from 0 to 24. A total score of 0-9 indicates no depression, 10-14 mild depression, 15-19 moderate depression, and 20+ severe depression.

The BAI is a 21-item questionnaire to assess anxiety symptoms. The respondent is asked on a 0 (not at all) to 3 (severely) Likert scale how much he or she was bothered by each symptom (e.g., feeling nervous, unable to relax, and feeling shaky or unsteady during the past month). Total scores can range from 0 to 63. A score of 0-21 is considered a normal level of anxiety; 22-26 as mild anxiety; 27-31 as moderate anxiety, and 32-63 as severe anxiety. The BAI has been demonstrated as valid and reliable screening instrument in detecting presence of current anxiety in adults (Kabacoff, Segal, Hersen, & Van Hasselt, 1997).

Insomnia and sleep habits were evaluated by the PSQI, which has 19 self-rated questions measuring sleep quality the past month. Sample items include: "how many minutes does it take for you to fall asleep each night" and "in the past month how often do you have to get up in the middle of the night or early morning." Scoring of answers is based on a 0 (not during the past month) to 3 scale (three or more times a week). Seven components are scored together, and a score of 5 or greater indicates poor sleep quality. This test has shown to have adequate internal consistency and reliable self-report measures (Bastien, Vallières, & Morin, 2001; Buysse et al., 1989).

The Mindfulness Attention Awareness Scale (MAAS) is a widely disseminated tool to measure mindfulness as present-centered attention-awareness in everyday experiences (Brown & Ryan, 2003). Mindfulness, a receptive attention to and awareness of the present moment, has gained attention of clinicians in the last 25 years due to its association with improved mental and physical health (Garland et al., 2014). This test has a total of 15 items, and individuals respond to each item on a 6-point scale (1= almost always to 6 = almost never). Sample questions include: "I find myself

doing things without paying attention," and "I do jobs or tasks automatically, without being aware of what I'm doing." Internal consistency of the MASS has Cronbach alpha ranging from 0.78 to 0.92 and evidence of test-retest reliability (ICC) of 0.81 (Black, Sussman, Johnson, & Milam, 2012). Note that, unlike for the other measures in which a lower post-intervention score would indicate improvement, for this measure a higher post-intervention score would indicate improvement.

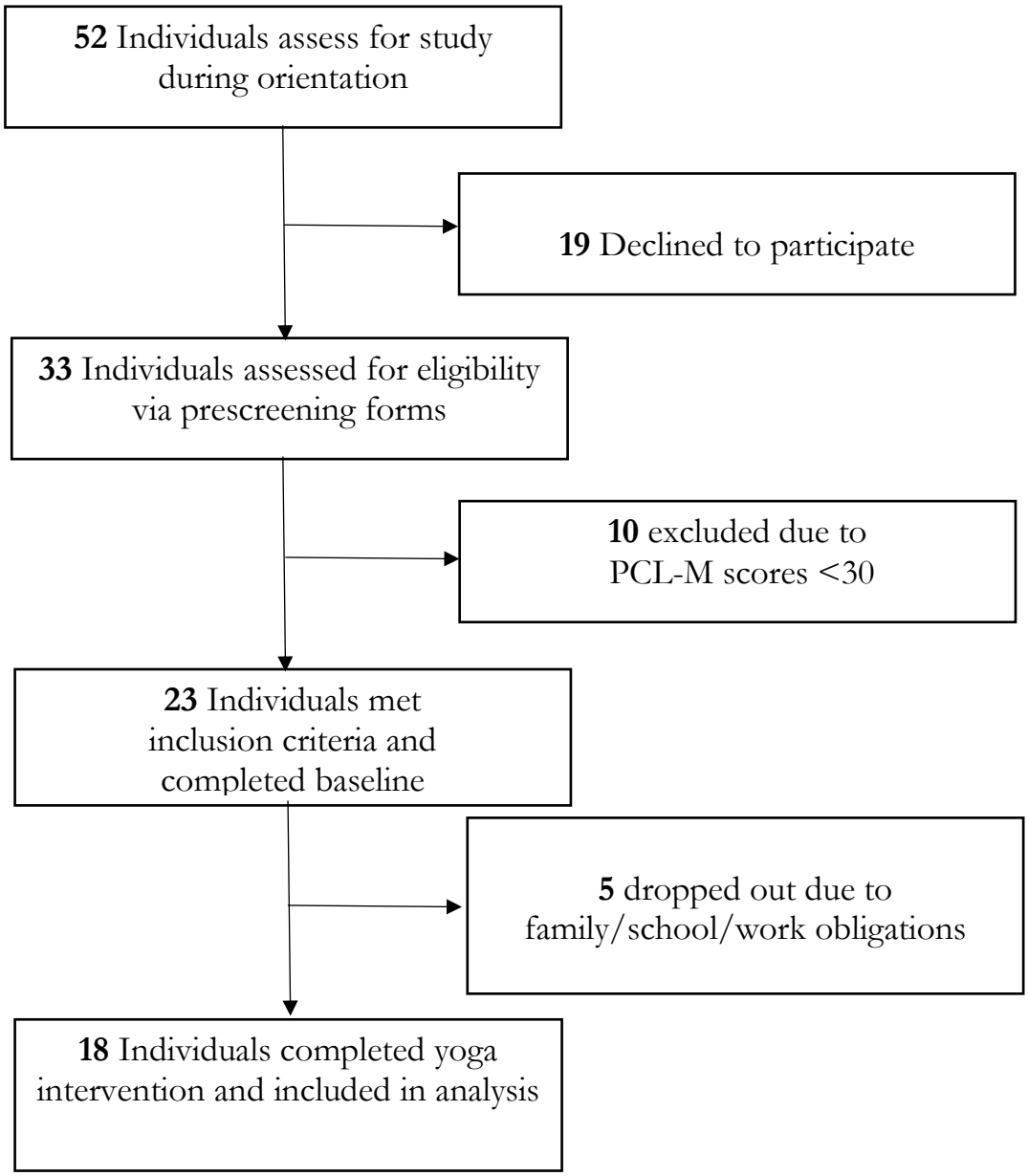
Data Analysis

Descriptive statistics were used to summarize the veterans' demographic information. Prior to conducting the analysis, baseline and post data were assessed for normal distribution using the Shapiro-Wilk test. The assumption was considered satisfied, Scores on the primary (PCL-M) and secondary (self-reported anxiety, depression, and insomnia, and mindfulness) measures were compared before and after the intervention using the paired *t*-test to evaluate change following the yoga intervention. Effect sizes were measured using Cohen's d, hoping for at least a medium (d= 0.5) effect size (Lakens, 2013). Statistical analyses were performed using the Statistical Package for Social Sciences for Windows. For all statistical tests, two-tailed *p*=values less than 0.05 were considered statistically significant.

Results

Figure 3.1 describes the participant flow through the study. Fifty-two veterans from OIF/OEF/OND with combat-related symptoms inquired about and were verbally informed about the study. Of these, thirty-three veterans consented and completed the PCL-M to screen for eligibility to participate. Ten were excluded because their PCL-M score was less than 30. Twenty-three veterans met eligibility criteria and enrolled in the study. Of these twenty-three, eighteen veterans completed 5 out of 7 consecutive weeks of the yoga intervention, for a completion rate of 78.26%.

Figure 3.1. Flow of Participants through Yoga Trial



Descriptive data for all participants are presented in Table 2. The ages of participants ranged from 26-62, with a mean age of 43 (*SD* = 9.7). Nine participants were female, and nine were male. Twelve participants were from the Army, three from the Marines, two from the Air Force, and one from the Navy. Five were officers, and 13 were enlisted. The range in length of service was broad, from 2 years to 34 years (Mean=17.4, SD=9.2). Fifty percent of the participants identified themselves as white, and the remaining identified themselves as Asian, Pacific Islander, and Hispanic Latino. Six of the 18 participants were married, six were single, and six were divorced/separated. All participants completed high school education, plus five had some college education, three had bachelor's degrees, and ten had a graduate level degree.

Table 3.2. Participant Characteristics

	Value
Age in Years, Mean (SD), (Range 26-62)	43 (9.7)
Sex *(n)*	
Male	9
Female	9
Military Branch *(n)*	
Army	12
Navy	1
Air Force	2
Marine Corps	3
Rank	
Officers	5
Enlisted	13
Ethnicity *(n)*	
White	10
Asian	5
Pacific Islander	2
Hispanic Latino	1
Marital Status	
Single	6
Married	6
Divorced/Separated	6
Highest Level of Education *(n)*	
Graduate Degree	10
Bachelor	3
Some College	5
High School Education	0
How many years on service, Mean (SD), (Range 2-34)	17.42 (9.191)

Results for the primary outcome measure PCL-M are shown in *Table 3.3*. The psychometric forms were completed after the participants' last yoga session. The mean PCL scores improved from baseline from 47.67 to a 30.06 after the yoga intervention. This yielded a mean change of 17.61 points from pretest to posttest, and this improvement was statistically significant. It also should be noted that a change of 10 or more points on the PCL-M is considered clinically significant as well (Monson et al., 2008). There were significant decreases in scores for all three clusters of PCL-M from pre to post measures; hyperarousal scores decreased 6.11 points ($t(17) = 9.17$, $p < .005$), re-experiencing symptoms decreased 5.08 points ($t(17) = 5.19$, $p < .05$), and avoidance symptoms decreased6.17 points ($t(17) = 7.96$, $p < .05$). The baseline to post effect size for PCL-M total score was 1.93, which means the effect size was large.

Table 3.3. Mean Scores of PTSD (n=18)

Measure	Baseline Mean (SD)	Post Mean (SD)	Test Statistic	*p* value
PCL-M Total Score	47.67 (14.971)	30.06 (8.36)	*t* = 8.22	<.005
Hyperarousal	15.22 (3.96)	9.11 (1.90)	*t* = 9.17	<.005
Reexperiencing	12.83 (6.12)	7.78 (2.94)	*t* = 5.19	<.005
Avoidance	19.22 (6.31)	13.05 (4.38)	*t* = 7.96	<.005

While the post-yoga group's PSQI score dropped significantly, from 13.00 to 9.67 ($t(17) = 4.64$, $p < .005$), the improvement was not clinically meaningful as the post-intervention PSQI was still greater than 5.00 (i.e., greater than 5.00 on PSQI is consistent with sleep disturbances). PSQI measurements only indicate good or poor sleep quality but does not establish different levels of severity of sleep deficiency. The participant's pre-yoga PHQ-8 score was 11.89, in the mild depression range., but this dropped to 6.77, in the no-depression range, ($t(17) = 5.61$, $p < .005$). The BAI score decreased from 20.33 to 11.22, which translates as going from moderate anxiety to mild anxiety ($t(17) = 5.67$, $p < .005$).

Table 3.4. Mean Scores of Mindfulness, Insomnia, Depression, and Anxiety (n=18)

Measure	Baseline Mean (SD)	Post Mean (SD)	Test Statistic	*p* value
MAAS	47.94 (19.18)	60.00 (13.74)	*t* = -4.21	.01
PSQI Total Score	13.00 (4.790)	9.67 (3.88)	*t* = 4.64	<.005
PHQ-8	11.89 (6.471)	6.77 (4.31)	*t* = 5.61	<.005
BAI	20.33 (12.81)	11.22 (9.67)	*t* = 5.67	<.005

Discussion

This pre-post study of a trauma-sensitive yoga intervention demonstrated decreased PTSD symptoms for all three symptom clusters (hyperarousal, reexperiencing, and numbness/avoidance), as well as total PTSD score. It also demonstrated improvement in mindfulness and decreases in insomnia, depression, and anxiety symptoms. Thus, the results of this small, uncontrolled pilot study found that trauma-sensitive yoga can help alleviate negative mental health symptoms in OIF/OEF/OND veterans with combat-related PTSD.

This is the first trial of Vinyasa trauma-sensitive yoga class for OIF/OEF/OND veterans that I am aware of. Earlier in 2016 a systematic literature review found fifteen other mind-body therapies that reduced PTSD symptoms in OIF/OEF/OND veterans (Bhatnagar et al., 2013; Bormann et al., 2013b, 2008; Cole et al., 2015; Kearney, Malte, et al., 2013; Kearney, McDermott, Malte, Martinez, & Simpson, 2012; Kearney, McDermott, et al., 2013; Nakamura et al., 2011; Niles, Vujanovic, Silberbogen, Seligowski, & Potter, 2013; Polusny et al., 2015a; Possemato et al., 2016; Rosenthal et al., 2011; Seppälä et al., 2014b; Staples et al., 2013; Wahbeh et al., 2016); however, the results were not as significant as this study. A possible reason for this is that the mind-body therapies in the review were much less physically active than the Vinyasa yoga intervention. Vinyasa yoga or hatha yoga is a movement-based yoga practice that uses the breath to synch with the movements. This form of yoga can improve cardio-respiratory fitness in unfit or sedentary individuals (Hagins, Moore, & Rundle, 2007). A meta-analysis looking at just physical activity as a treatment of PTSD found that PA is a positive intervention for people with PTSD, especially veterans with PTSD with depressive symptoms (Rosenbaum et al., 2015).

Another possible reason this study fared better than the other mind-body therapies evaluated in the literature is because the instructor was a combat veteran who has deployed to Iraq and Afghanistan. The other therapies were conducted by academia professionals who never served in the military. Having a common interest such, as the longtime military service and combat deployments, may have helped build trust between the participants and the instructor. As one yoga participant stated after class, "the success or failure of getting veteran recruits was hinged on the yoga instructor's credibility, ability to successfully teach the yoga class, and willingness to modify the activities for the participants."

The secondary measure that showed the most improvement was mindfulness. There is limited data that shows how mindful awareness that is incorporated in yoga can improve PTSD

symptoms. One theory is that mindfulness takes the veteran into the present moment, and this may reduce their re-experiencing and hyperarousal PTSD symptoms. The results also demonstrated that veterans that practiced yoga can improve their overall sleep quality. Sleep can be disturbed by hyperarousal symptoms, which can cause insomnia, and re-experiencing symptoms, which include nightmares. Reducing hyperarousal and re-experiencing symptoms may have helped improve deep sleep and improve sleep efficiency.

Research of yoga as a therapeutic modality is relatively new and not common in military communities. Since there are so many different styles of yoga practices, finding a trauma- sensitive protocol that can be widely disseminated in the military population is crucial (Sherman, 2012). The participants in this study suffered from invisible wounds, but were physically fit to participate in the Vinyasa style yoga. However there is a need to consider physical limitations with Veterans who may also be suffering from other comorbidities (e.g., neck/back pain, traumatic brain injury, amputees). Warriors At Ease level two and level three yoga certification provides further training to yoga instructors to be able to provide adaptive yoga for these unique military populations.

Limitations

There were many limitations in this study, including a small sample size and lack of a control group. The initial power calculation showed that a sample size of 34 people was needed for the PTSD primary outcome measure to have a 0.95 power to find an effect size $d = 0.5$ at an α level of 0.05 (Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A., 2007) . Of the 52 recruited, 19 declined to participate, and 10 did not meet PTSD criteria for inclusion. Several participates dropped out of the study because of deployment or conflicts with work or school schedules. Thus, only 23 started the intervention, and only 18 completed the intervention. Despite the small sample, improvements were reported by participants. Another limitation is that there was no follow up after the intervention was over. There is no way to know if the PTSD symptoms returned to baseline levels in the months after the study was completed.

Another limitation was that the characteristics of the participant population were very different than expected. Females comprise 15.5 percent of the DoD Active Duty force ("2015-Demographics-Report.pdf," n.d.), but in this study 50% of the participants were female. Many of the male participants commented on their first day that they were reluctant to participate because they felt yoga was only for females. Also, the participants in this study were also much older than expected. Over one half of Active Duty enlisted personnel are 25 years of age or younger, followed

by 20% being 26 to 30, 14% being 31 to 35, and 8.8% being 36 to 40 years, and 5.3% are 41 years or older ("2015-Demographics-Report.pdf," n.d.). This study recruited OEF, OIF, and OND veterans only, but the average age was 43 years. The other surprise was that the participants in this study were well educated, with most having some college experience and five being officers. It appeared that the enlisted individuals gained their college experience post-deployment, likely through the GI Bill or the Post 911 GI Bill and that the officers may have been "older" than the average recruit when they were deployed to the Middle East. Still, as a condition of participation, the participants still had PTSD symptoms from their deployment. Perhaps the recruitment process for this study attracted older and educated veterans. Future studies should recruit larger, younger sample (e.g., veterans or Service Members under age 30), have a control group, and collect follow-up data at 6 months and perhaps one year after the intervention.

CHAPTER 4

A Qualitative Study Exploring Yoga in Veterans with PTSD Symptoms

Abstract

Quantitative studies of yoga have reported reduced PTSD symptoms in veterans, but little is known about how and why veterans are attracted to and stick with a yoga practice. Guided by the Health Belief Model, this study examined veterans' perceptions of the benefits, barriers, and motivations to continue practicing trauma-sensitive yoga. Interviews were conducted with 9 individuals, 5 who completed a 6-week trauma-sensitive yoga intervention for designed for veterans, and 4 who did not complete the intervention. Transcripts were analyzed for themes. The benefits identified by veterans were finding stillness, body awareness, and social connection. The barriers were perceptions that yoga is socially unacceptable and physically unchallenging. Findings also suggest that engaging military and medical personnel practitioners in referring service members and veterans with PTSD symptoms to a trauma-sensitive yoga practice may increase the practice of yoga and the benefits it yields. This information can help the Department of Defense and the Veterans Health Administration implement yoga as an adjunct or alternative treatment for veterans with PTSD symptoms.

Keywords: Yoga, Veterans, PTSD, Interviews, health belief model, thematic analysis

Introduction

United States military veterans of wars in the Middle East have returned home with multiple physical and invisible injuries. Posttraumatic stress disorder (PTSD) remains one of the most detrimental injuries experienced by United States military personnel occurred since the attack on the World Trade Centers in 2001. PTSD is classified under a category of Trauma and Stress Related Disorders in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association & American Psychiatric Association, 2013) and is defined as exposure to actual or threatened death, injury, or sexual violence with symptoms in four different clusters: re-experiencing, avoidance, negative alterations in mood, and hyperarousal. PTSD can have lifelong symptomatology and impact all areas of a veteran's life, including physical health (e.g., increasing inflammatory cardiovascular diseases) and destroying family and social relationships (Brudey et al., 2015; Miller et al., 2013).

The Department of Defense (DoD) and Veterans Health Administration (VHA) continue to make great strides on treating PTSD. Current treatments for PTSD include prolonged exposure (PE) therapy, cognitive processing therapy (CPT), eye movement desensitization and reprocessing (EMDR), selective serotonin reuptake inhibitors, and other pharmacotherapies (Committee on the Assessment of Ongoing Effects in the Treatment of Posttraumatic Stress Disorder & Institute of Medicine, 2012). However, many veterans feel that the current PTSD treatments are not meeting their needs. One reason is that many military service members suffering from PTSD have not had success with conventional PTSD treatments. Another reason is that the service member would like to go drug-free and try a self-care practice. There also continues to be the negative stigma of seeking out behavioral health care among service members and veterans (Hoge et al., 2008; Stecker et al., 2013)

The use of complementary and alternative medicine (CAM) in the military is higher than in the civilian population. A military survey demonstrated that as many as 45% of military individuals are using at least one form of CAM, compared to only 36% of civilians (Goertz et al., 2013). This survey asked about use of more than 19 different CAM practices, and the eight most frequently reported were mind-body therapies, including prayer for your own health, relaxation techniques, art/music therapy, and exercise/movement therapy (Goertz et al., 2013). Three of the CAM therapies (yoga, massage, and imagery) were used 2.5-7 times more often by service members than by their civilian counterparts (Jonas, Welton, Delgado, Gordon, & Zhang, 2014)

A literature review of mind-body therapies—including seated or gentle yoga that included breath work, meditation, mantra repetition, or breathing exercises—found significant improvements in PTSD symptoms in participating military veterans (Cushing, unpublished 2016a). More recently, a 6-week trial conducted by the same author found that military-tailored yoga can reduce PTSD symptoms in veterans of Middle Eastern conflicts (Cushing, unpublished 2016b). The military-tailored yoga was developed by Meghan's Foundation (Shortt, Maureen et al., n.d.), which adopted their trauma-sensitive protocol from Warriors at Ease ("Warriors at Ease - Health | Resiliency | Connection," n.d.). These yoga classes included flowing movements of different postures that is synchronized with the breath. All classes were open to all veterans, service members, and significant others. Classes were 60 minutes in length and offered weekly. Completers of the intervention attended at least five weekly yoga sessions in seven weeks. Eighteen (of twenty-three) participants completed the six-week yoga intervention and realized statistically significant reductions in PTSD symptoms, anxiety and depression and significant improvements in sleep quality, and mindfulness.

Military-tailored yoga is trauma-sensitive yoga being taught by nonprofit organizations like Warriors At Ease and the Meghan's Foundation. These foundations ensure that the yoga is taught in safe environment that reduces trauma triggers in veterans. Many traditional yoga classes use Sanskrit words to describe the yoga pose and use Indian or exotic music that could invoke memories of their Middle Easter deployment. These are limited in the military tailored yoga class to ensure that the class is safe and comfortable. In many regular yoga classes, the instructor will physically touch the students to assist them in their pose. However, all hands-on adjustments or assists are avoided to ensure the veterans are comfortable. Seated meditation and laying down meditation is usually done with eyes close, but in military-tailored yoga the students are given the option to close or leave their eyes open.

The purpose of this qualitative study was to examine the perceived benefits of military-tailored, trauma-sensitive yoga and to hear the veteran's stories on how the yoga helped improve their mental wellbeing. Since there was over 19 that declined to take part in the quantitative study and over 5 that did not complete the intervention, this study will also look at perceived barriers to yoga. Themes from these stories will provide relevant information to the DoD and the VHA on how yoga can be made more attractive to veterans and service members. Ethics approval was received from the Institutional Review Board at the University of Hawaii, Manoa.

Methods

The sample was accrued from those veterans who expressed interest in the quantitative test of a yoga intervention on PTSD symptoms (Cushing, unpublished 2016b). This sample was recruited through veteran service organizations (VSO) such as the Wounded Warriors Project, Team Red, White, and Blue, and the Oahu Veterans Center. The inclusion criteria for the yoga intervention was Middle East veterans with combat-related PTSD symptoms who scored 30 or higher on the PTSD Checklist Military (PCL-M) ("PTSD Checklist for DSM-5 (PCL-5) - PTSD: National Center for PTSD," n.d.). At the time of recruitment into the quantitative yoga study, participants were informed about a follow-up qualitative study. For the qualitative study, the participants from the quantitative study were purposively sampled to include some who completed the 6-week intervention and some that dropped out after completing only one or two sessions. Interviews were conducted with nine individuals, five who completed at least 5 out of 7 weeks of trauma-sensitive yoga, and 4 who did not complete the intervention.

The Health Belief Model (HBM) served as the theoretical foundation of this qualitative study (DiClemente, Salazar, & Crosby, 2013). The HBM was chosen to understand why veterans continued or discontinued the yoga intervention. See *Table 4.1* and *Table 4.2* for questions for the yoga participants and the nonparticipants.

Table 4.1. Open-Ended Questions for Yoga Participants

1. Warm-Up
   a. How many military-tailored yoga sessions have you attended.
   b. Have you attended any other yoga classes? If so, what kind and how many?
   c. Where do you practice yoga?
   d. What is your definition of yoga?
   e. What did you expect when you started to practice yoga?
2. Starting yoga (Cues to Action)
   a. How does one make the decision to start yoga?
   b. What makes them continue to practice?
   c. What are the most important parts or components of yoga for you?
   d. What was it like for you when you started out?
3. Perceived Benefits
   a. What mental health benefits do you expect or have seen since you have been practicing?
   b. What physical health benefits do you expect or have seen since you have been practicing?
   c. What health concerns might yoga help? Are there any health concerns that yoga would not help or would make worse?
   d. Do you practice yoga to help with a specific illness or health concern? How has yoga affected this condition?

e. Has a friend or family member notice a change in your behavior since you have practiced yoga?
f. Do you think yoga can help prevent/treat PTSD? Depression? Substance Abuse? Insomnia?
g. What do you think are some of the key benefits to practicing yoga?
h. (If applicable) How do you compare military-tailored yoga to other styles of yoga? What do you like? What do you not like?

4. Perceived Barriers
   a. Why do you think some Service Members or Veterans do not want to practice yoga?
   b. What expenses do you associate with yoga?
   c. Has yoga ever aggravated any symptoms or health-related issues for you?
5. Close
   a. Do you have any other thoughts about yoga that you would like to share?

Table 4.2. Open-Ended Questions for Yoga nonparticipants

1. Warm-Up
   a. How many military-tailored yoga sessions have you attended.
   b. What is your definition of yoga?
2. Starting yoga (Cues to Action)
   a. How does one make the decision to start yoga?
   b. What makes them continue to practice?
3. Perceived Benefits
   a. What have you heard about the benefits of practicing yoga?
   b. What physical health benefits might yoga help?
   c. What health concerns might yoga help? Are there any health concerns that yoga would not help or would make worse?
   d. Do you think yoga can help prevent/treat PTSD? Depression? Substance Abuse? Insomnia?
4. Perceived Barriers
   a. What are some reasons why you do not want to practice yoga? Prompts (physical barriers, logistical barriers, psychological barriers, social barriers, cost barriers)
   b. What do you think are reasons why other Service Members or Veterans do not want to practice yoga?
   c. What expenses do you associate with yoga?
5. Close
   a. Do you have any other thoughts about yoga that you would like to share?

Semi-structured, open-ended interviews lasted 30 to 40 minutes and were conducted from November 2016 to January 2017. After written consent, the interviews took place in the participant's home, or a public place such as a coffee shop or library. Participants were given a $5 Starbucks gift card in appreciation of their participation. Interviews were audio recorded, transcribed

verbatim, and analyzed for themes related to benefits, barriers, and motivations to continued participation in yoga.

After the interviews were transcribed, a descriptive thematic content analysis was conducted. Thematic analysis (TA) focuses on patterns across all the veteran's interviews (Braun & Clarke, 2014). This was conducted in five phases. The first phase was familiarization with the data, with the author reading and re-reading the transcripts to become immersed with the data. The second phase was coding the data by bolding the text that captured a key thought. The third phase was searching for themes from the codes to identify broader patterns. The fourth phase was reviewing the themes to see how they could answer the research questions. The fifth and final phase was defining and naming the themes.

Results

There were nine participants interviewed for this study, five who completed the yoga intervention and four who did not complete the intervention. All participants were military veterans between the ages of 22 to 52 years, with a mean age of 37. All were veterans of a post-9/11 conflict, and the mean age of the participants at their first deployment to Iraq or Afghanistan was 25 years. The youngest was deployed as a low ranking enlisted private in a tank unit, while the oldest was a high ranking first sergeant of an infantry unit. The completers of the yoga intervention are on average 4 years older than the non-completers. Eight of the participants were male and one was female, with the only female being a non-completer of the intervention. Three of the participants interviewed identified as Hispanic/Latino, two as Asian, two as Caucasian, and one identified as Native Hawaiian/Pacific Islander. Participants had mild to moderate PTSD, which was established by the PCL-M score of 30 or higher ("PTSD Checklist for DSM-5 (PCL-5) - PTSD: National Center for PTSD," n.d.).

There were three main themes found for perceived benefits and two perceived barriers. The three themes for the perceived benefits were "finding stillness," "body awareness," and "social connection." The two themes for perceived barriers were "socially *un*acceptable" and "physically *un*challenging." An overview of the themes is seen in *Table 4.3*.

Table 4.3. Common Themes Expressed by Completers and Non-Completers

Perceived Benefits

- Finding Stillness (mental wellbeing) – mentioned by 9 of 9 participants
- Body Awareness (physical wellbeing) – mentioned by 7 of 9 participants
- Social Connection (social wellbeing) – mentioned by 5 of 9 participants

Perceived Barriers

- Socially *un*acceptable – mentioned by 9 of the 9 participants
- Physically *un*challenging – mentioned by 5 of the 9 participants

Perceived Benefit: Theme 1. Finding stillness

All nine participants (including those that discontinued practice) discussed how the yoga helped them with improving their mental wellbeing. The veterans discussed how the yoga practice was calming and how they were able to quiet their mental chatter. This finding also correlated with the quantitative findings that showed how yoga helped decrease PTSD, anxiety, depression, and increased mindfulness (Cushing, 2016b). Quotes that illustrate this theme follow.

> *Yoga helped me find my center. I was able to take my mind off of everything. The physical part was nice to increase flexibility; but really what helped was to manage what was going on in my head.*

> *After yoga session, I was not as quick to get angry. Yoga helped me to identify my anger triggers. I was able to look inward and ask myself 'why did that just trigger me to get mad?' I have time to process before reacting.*

> *Yoga helped my mind relax. Especially practicing on a weekday, I was able to finish the week with a fresh mind. Before yoga I was only able to unwind on the weekends, but now I look forward to yoga to help unwind.*

> *Off the mat, I am able to prioritize things because I am able to focus on the task at hand.*

Perceived Benefit: Theme 2. Body Awareness

Seven of the nine participants (6 completers and 1 non-completers) reported that the physical practice of yoga supported a healthy mind-body relationship. This new sense of body awareness allowed veterans to connect with their bodies differently than before. This body awareness is key to why yoga is a mind-body therapy. These quotes illustrate benefits of growing body awareness among participants.

I became more tolerant of being uncomfortable. When I am working out doing other physical activities, I don't notice how my body feels. I just push through it. Yoga helped me stay in tune with my body even off the mat. I am able to notice where in my body I am feeling pain.

Once I started yoga, and saw physical health benefits such as increased flexibility and weight loss. I noticed I had better range of motion than I had in years and I started to feel more mobile.

Yoga has helped me bring awareness to different parts of my body. So I learn more about myself and how my body reacts to different yoga poses that I might not notice before with other forms of physical activities.

Three of the nine veterans (all completers) specifically discussed how they were able to focus on stretching their lumbar region to help ease back pain. These three participants were all over the age of 35 years and have done at least two combat tours.

Flexibility was one of the best benefits of the yoga class. From carrying military equipment and wearing Army gear, my lower back started to act up and I would get back spasms. The yoga sequence would help alleviate some of the lower back pain.

My chronic pain disappeared after morning yoga. I wish I did this when I was serving, because in the infantry I had to do a lot of ruck marches and put a lot of miles on my feet and my back had to carry all that extra weight of a rucksack. I suffer from chronic low back pain and after doing yoga in the morning, I realized my back pain was gone for that day.

If I did yoga through my military career I wouldn't be as broke as I am now.
Yeah if I would have worked on recovery and flexibility, I would have saved my knees and back. Preventive maintenance on a vehicle or a weapon. You clean your weapon to have longevity and you need to do the same thing on your body so that it will work for longer periods of time. My back pain has eased some when I include yoga in my weekly practice.

Perceived Benefit: Theme 3. Social Connection

Five of the nine veterans (all completers) discussed how PTSD symptoms can be isolating due to emotional and physiological struggles. They reported that having the opportunity to be around other veterans with PTSD helped them feel socially supported. These veterans noted that yoga was different from a PTSD support group, in which one discusses his/her combat experiences. In yoga, even though they did not discuss the cause of their PTSD, knowing that others in the room have been through similar situations allowed them to feel included and comfortable.

Knowing other people in the class have similar background helps out a lot, especially that first time of trying yoga. I do not see myself going to a yoga studio or yoga class if the students are not veterans.

I think being vulnerable is hard for veterans…Knowing you can be in a safe space that is open to other military veterans will help allow other veterans to practice yoga.

I struggle with symptoms of being hypervigilant and isolating myself. The yoga group helped me to connect with others and helped me with my isolation symptoms. Yoga is individual, but, when coming to a military tailored yoga class, that connection part can help with the isolation symptoms. This is something that you cannot get if you just go to a regular yoga studio class that is not tailored to the military.

Perceived Barrier: Socially *Un*acceptable & Physically *Un*challenging

The two common barriers were that yoga was perceived as socially unacceptable for veterans and physically unchallenging. These two barriers overlapped in all nine of the veteran's interviews. When asked why veterans would not want to practice yoga, many discussed how the culture of the military is still a very macho world.

Many veterans may not want to practice yoga for two reasons. Number one reason is that yoga is for women and the second reason is that you will not get anything out of it. Many service members and veterans want to be physically pushed, and they might not think yoga can do that.

Some veterans think that you have to be an expert to do yoga, and you have to be perfect. They are also worried about the stigma. Most people who do yoga on TV or in movies are females or hipsters who wear yoga pants. People are scared to get labeled and put in that category. People in the military…are to be tough. But if you are walking around with a yoga mat…people won't think you are tough.

My first thought of yoga was hippies. When my friend asked me to join him in yoga, I thought he was crazy. There is no way I can fit inside tight pants with my junk exposed. I think yoga is a very feminine movement, and guys cannot get past that.

The mainstream is because yoga has been looked at NOT as a physical activity. In the military, we are a physical culture –running, lifting weights, and the mindset of veterans and service members going to yoga is it will not be physical enough for us.

Yoga is about being open, and this is the hardest part for veterans. To be able to be vulnerable. I feel like if we can make it part of our daily routine, it can help improve resiliency and mental and physical health. I think being vulnerable is hard for veterans. We wear body armor and we need to stay vigilant. So then in yoga we are told to relax and focus inward. That is hard to grasp for some.

Discussion

The qualitative study provides insight into the benefits and barriers of participating in yoga. Some findings were not unexpected, but some provide new insight into how yoga can help veterans with PTSD. Assessing the benefits and barriers of yoga is crucial as many veterans are using yoga and other CAM therapies on their own to help in treat their PTSD symptoms (Jonas et al., 2014).

The qualitative analysis revealed three major benefits and two barriers in practicing yoga in the veteran community.

Learning mindfulness techniques by being present in the yoga practice allowed many veterans to shift their negative mind-chatter to the present moment. As found in the quantitative study and in the literature review, yoga has been shown to reduce PTSD symptoms along with anxiety and depression (Bhatnagar et al., 2013; Bormann et al., 2013a, 2008; Cole et al., 2015; Kearney, Malte, et al., 2013; Kearney, McDermott, Malte, Martinez, & Simpson, 2012; Nakamura et al., 2011; Niles et al., 2013; Polusny et al., 2015b; Possemato et al., 2016; Rosenthal et al., 2011; Seppälä et al., 2014b; Staples et al., 2013; Wahbeh et al., 2016). The mechanism at work in yoga is its role in reducing stress and anxiety by impacting autonomic nervous system (ANS) activity (Streeter, Gerbarg, Saper, Ciraulo, & Brown, 2012). The ANS has two major components: sympathetic nervous system (SNS) or fight or flight and the parasympathetic nervous system (PNS) or rest and digest. There have been many studies that show veterans with PTSD have an imbalance of these two systems and have increased SNS activity (Wingenfeld, Whooley, Neylan, Otte, & Cohen, 2015).

The more surprising findings were the many physical benefits found during this qualitative study. For example, three participants reported that yoga participation led to reduction in their lower back pain. There are many different nonpharmacological therapy trials looking at how yoga has been able to reduce chronic lower back pain (Chou et al., 2017). The American College of Physicians (ACP) now recommends starting with nonpharmacological treatments, such as yoga, for chronic lower back pain over pharmacological treatment (Qaseem, Wilt, McLean, Forciea, & Clinical Guidelines Committee of the American College of Physicians, 2017). Understanding that many veterans with PTSD also suffer from other chronic issues is important, as many veterans suffer from chronic pain. Approximately 23% of Operation Iraqi Freedom/Operation Enduring Freedom/Operation New Dawn (OIF/OEF/OND) Veterans and 35% of those with traumatic brain injury (TBI) receive opioid medications, and back pain is the most common reason for being prescribed pain medication (Hudson et al., 2017).

Another unexpected benefit was the social connections made in the class. Isolation is a common symptom of many veterans with PTSD. The yoga class allowed veterans to come together and connect with other like-minded veterans. This helped decrease isolation symptoms and also allowed for the participants to be more comfortable with trying something new. As expressed by some of the participants, just knowing that all the people in the class, including the instructor, was a

veteran of a recent Middle East conflict made them feel included. The support of the participants and yoga teacher allowed the environment to feel safe, which facilitated a sense of connectedness with others. Feeling connectedness, or a sense of self in the world, is associated with mental wellness. It has been suggested that connectedness is more powerful then direct social support when predicting depression and self-esteem (Williams & Galliher, 2006).

Unfortunately, the two barriers were not surprising. All nine veterans associated yoga with being a female activity rather than a male activity. Statistics concur, demonstrating that the average lifetime yoga practitioner is a young or middle-aged female, college educated, and living in the West (Cramer et al., 2016). Every monthly cover of the magazine *Yoga Journal* in 2016 featured a young female. As yoga practitioners are seen as female, veterans are seen predominately as male. Male veterans comprise about 85% of all veterans, with about 94% utilizing VHA benefits ("Fact Sheet - WH_facts_FINAL.pdf," n.d.).

The second barrier to yoga participation is that they did not believe yoga was a rigorous physical activity, which most service members desire. Yoga is considered a light-intensity physical activity. Only a few of the sequences, such as the sun salutation sequence, meets the criteria for moderate to vigorous activity (Larson-Meyer, 2016).

Based on these barriers and benefits, a list of cues to action and overcoming barriers can be built to help the DoD and VHA promote and successfully implementing a yoga program (*Table 4.4*). For example, letting service members know that the trauma-sensitive yoga program was developed by Warriors At Ease could help reduce the barrier that yoga is only for females. Some styles of yoga and some yoga poses are more physically demanding than others, and these can be woven into an intervention for service members and veterans. This could help remove the stigma that yoga is not physically challenging. Another approach is to promote yoga by noting its specific desirable health benefits, such as reduced back pain, on recruitment flyers. Related to this is to connect yoga to improving body awareness and flexibility, which can improve range of motion and athletic performance, and reduce risk of injury (Rachiwong, Panasiriwong, Saosomphop, Widjaja, & Ajjimaporn, 2015; "Stretching," n.d.). Disseminating information of the benefits of yoga to medical, pain, and behavioral health providers working with veterans could increase their willingness to refer clients to or even prescribe yoga. VSOs could also refer veterans to veteran-focused yoga classes as a way to interact with veterans outside of counseling and support groups. Finally, veterans who find benefit in yoga can be encouraged and perhaps incentivized to bring a friend. Social opportunities,

such as bringing a friend, has been used an effective retention strategy for community health programs. Veterans connect with others and can feel safe without fear of being judged in a negative way during the yoga session (McCann, Ridgers, Carver, Thornton, & Teychenne, 2013).

Table 4.4. Cues to Action & Overcoming Barriers

Motivators	Ways they can inform future Cues to Action
• Mental health concerns: PTSD symptoms, work stress (mental wellbeing)	• Work with behavioral health providers, primary care providers, OIF/OEF/OND support groups
• Physical health concerns: Back Pain, limited mobility (physical wellbeing)	• Work with back pain clinic and physical therapy to recruit participants…perhaps they could prescribe to yoga class
• Peers encouragement (social wellbeing)	• Encourage each participant to bring a veteran friend. Work with different VSOs
Barriers	**Ways to overcome barriers**
• Yoga is only for women	• Trauma sensitive yoga that is tailored to military using Warriors At Ease protocol
• Yoga is not physically challenging	• Weave in sequences in yoga class to help challenge participants that are wanting a more physically challenging practice • Discuss the benefits of body awareness and flexibility which can improve physical performance

More research is needed to evaluate how yoga can help veterans and service members with PTSD. This study was limited in that the sample was very small. Also, it is not unusual for interviewees to provide socially desirable answers to research questions, especially when the interviewer also led the intervention. Even with the limitations, participants' responses provide insight on how yoga can benefit veterans and how to recruit more veterans to participate.

CHAPTER 5

This dissertation includes findings from three studies related to using mind-body therapy to reduce PTSD symptoms in veterans.

In the first study, a systematic literature review was conducted to explore the effect of mind-body therapy on reducing PTSD symptoms in military veterans and service members associated with post 9/11 conflicts. The search yielded 15 articles reporting on studies with veterans from OIF, OEF, and OND combat tours. Tested interventions included mind body stress reduction (MBSR), seated yoga, meditation, mind-body bridging, and mantram repetition programs (MRP), all of which are considered mobile and could be practiced by service members and veterans on their own. All the studies had promising findings, showing that mind-body therapies can be helpful in reducing PTSD symptoms. Yet, only one of the 15 studies had 100% of the participants from the OIF/OEF/OND. The majority of participants in the other studies were from the Vietnam era, who are older and likely retired, with more time to devote to therapy. None of the studies looked at movement-based yoga, such as a vinyasa yoga, even though this is a common mind-body therapy practiced by veterans. A national VA survey found the self-directed practices such as meditation, imagery, and yoga were the most frequency practiced mind-body therapies by veterans ("State of Care," n.d.). More research is needed on the effect of yoga on PTSD symptoms and how to recruit to and retain service members and veterans to mind-body classes (Elwy, Johnston, Bormann, Hull, & Taylor, 2014).

The second study evaluated a military-tailored yoga intervention following the Warriors At Ease and Meghan's Foundation trauma-sensitive protocol. While other researchers have studied the effect of yoga interventions on combat stress, none have both targeted OIF/OEF/OND veterans and administered PTSD measurements (Staples et al., 2013; Stoller et al., 2012). To the author's knowledge, this is the first study testing a trauma-sensitive yoga intervention with OIF/OEF/OND

veterans. In my study, 18 OIF/OEF/OND veterans, with PTSD symptoms were evaluated prior to and following a 6-weeks yoga intervention. on PTSD symptoms as a primary measure and depression, anxiety, insomnia, and mindfulness as secondary measures. The participants demonstrated significant reductions in PTSD symptoms and all of the secondary measures.

The purpose of the third study was to evaluate the benefits and barriers of yoga in the military setting and its potential role for improving mental wellbeing. Interviews were conducted with five veterans who completed the military-tailored yoga intervention described in Study 2, and four who dropped out. Thematic analysis was used to analyze the interview transcripts. The three main yoga benefits related to mental wellbeing, physical wellbeing, and social wellbeing. The two main barriers were the perception that yoga was socially unacceptable and physically unchallenging. Data suggested possible cues to action in expanding use of yoga, such as adding more physically challenging poses to the practice, stressing its benefits related to flexibility and balanced, getting veterans engaged in yoga to bring a friend, and disseminating information of the benefits of yoga to medical, pain, and behavioral health providers working with veterans could increase their willingness to refer clients to or even prescribe yoga.

Recommendations for Policy and Practice

Three major recommendations emerged from these three studies. First, VA and DoD need to adopt more mind-body therapies to veterans and service members. Not only should these therapies be offered in the clinic, but also in the units to allow Service Members on Active Duty to attend yoga as part of their physical training regimen. Second VA and DoD should ensure yoga and other mind-body therapies are trauma sensitive to reduce stimuli. Reducing stimuli and making the environment more relaxing can reduce hyperarousal PTSD symptoms in veterans. Learning the benefits of yoga helped to identify possible different military settings for yoga to be implemented. Different yoga settings include behavioral health clinics, Soldier Center Medical Home (SCMH),

Comprehensive Soldier and Family Fitness (CSF2) Training Center and Better Opportunities for Single Soldiers (BOSS). These settings can help promote the benefits of how yoga can improve mental wellbeing as well as increase social friendships. Seeing the many positive benefits of yoga on back pain, yoga can also be implemented in physical therapy offices at SCMH as well as back pain clinics.

Recommendations for Future Research

Future research is needed to look at how yoga can be implemented in the Active Duty military. Trying to capture not only the mental improvements in a unit, but also the physical improvements, an experimental study could be developed looking at yoga in one company and compare to a sister company of service members with similar demographics. Physical wellbeing could be measured by Army Physical Fitness Test which is to be conducted every six months in the US Army (Department of the Army, n.d.). The psychological and mental wellbeing could be measured by the annual survey called Global Assessment Tool (GAT) ("STAND-TO! - Global Assessment Tool, December 8, 2009," n.d.). Both the GAT and the CSF2 are part of the Army's Ready and Resiliency campaign ("U.S. Army Ready and Resilient," n.d.).

The yoga intervention in study two was conducted on physically fit individuals; however, many other wounds occur from the battlefields in Afghanistan and Iraq. American survivability during these conflicts continues to improve, though the rate of extremity injury remains quite high. These include traumatic brain injury (TBI), traumatic limb loss from amputations, and other orthopedic conditions. The VA Adaptive Sports Program and The Center for the Intrepid would be two settings where adaptive yoga could be used as a tool to help wounded warriors ("Intrepid Fallen Heroes Fund - The Center for the Intrepid," n.d., "VA Adaptive Sports Home," n.d.).

Another area for future research would be to follow-up with the participants in Study 2 to see if they continued with yoga practice and if they maintained benefits from yoga 6 to 12 months after the end of the intervention.

Conclusion

This dissertation research evaluated how yoga, a form of mind-body therapy, could help in alleviating PTSD symptoms in military veterans. As Middle East conflicts continue, so will the cases of PTSD in veterans. Several factors have helped in supporting the use of yoga as an adjunct treatment for veterans suffering from PTSD. First, veterans are seeking outside complementary therapies to help with PTSD, with yoga being the most popular modality. Second, yoga is a widely available, economically affordable, and a mobile form of practice. Third, there is growing literature to support that trauma-sensitive yoga can help to reduce PTSD symptoms.

APPENDIX A

Consent to Participate in Yoga-Testing Research Project:

My name is Robin E. Cushing. I am a graduate student at the University of Hawai`i at Manoa in the Office of Public Health Studies. As part of the requirements for earning my graduate degree, I am doing a research project as a requirement for earning my graduate degree. The purpose of my project is to evaluate how yoga can help service members and veterans with post-traumatic stress disorder (PTSD). I am asking you to participate because you have PTSD symptoms and you can help me evaluate yoga in the military population.

Activities and Time Commitment: If you participate in this project, you will meet one hour each week to participate in 60 minutes of military-tailored yoga. This yoga style is considered a gentle yoga style that combines meditation, yoga postures (movement), and breath work. During the yoga practice, I will demonstrate the postures, as well as provide modifications to different postures. To complete the intervention, you must complete at least 5 yoga sessions in the next 6 weeks. A mat will be provided during the session.

Additionally, I will collect data from you before your start the intervention and after 6 weeks in the program. This includes demographic information (for example your rank, age, and marital status) and information about any treatments you receive for PTSD. I also will ask you to complete several psychological tests, including tests for PTSD, anxiety, depression, insomnia, and mindfulness. Completing this should take no more than 30 minutes.

Benefits and Risks: military-tailored yoga may or may not benefit you. It may or may not reduce your PTSD symptoms, insomnia, or anxiety or improve your fitness flexibility. Participating may increase your risk of physical injury, especially if during yoga you put your body into a position you are not ready for. During seated, quiet meditation, you may experience intrusive memories from your past that could increase PTSD symptoms. If you are injured or distressed, health care services are available to you through the US Military.

Privacy and Confidentiality: I will keep all information in a safe place. Only my University of Hawai`i advisor and I will have access to the information. The University of Hawai`i Human Studies Program has the right to review research records for this study. After I code all metrics and I am finished with the yoga study, I will erase or destroy all paperwork. I will remove any personally identifiable information from the paperwork at the time they will be written. When I report the results of my research project, I will not use your name. I will not use any other personal identifying information that can identify you. I will be giving you a code ID number in order to report my findings in a way that protects your privacy and confidentiality to the extent allowed by law.

Voluntary Participation: Your participation in this project is completely voluntary. You may stop participating at any time. If you stop being in the study, there will be no penalty or loss to you. Your choice to participate or not participate will not affect your rights to services available to you through the US Military.

You will receive a $5 gift certificate for your time and effort in participating in this research project in the beginning of the yoga session and again when you have completed 5 yoga sessions.

Questions: If you have any questions about this study, please call or email me at {253-241-6526 and robinecushing@gmail.com]. You may also contact my adviser, Dr. Kathryn Braun at kbraun@hawaii.edu. If you have questions about your rights as a research participant, you may contact the UH Human Studies Program at 808-956-5007 or uhirb@hawaii.edu.

If you agree to participate in this project, please sign and date this signature page.

If you consent to be in this project, please sign the signature section below and return it to Robin Cushing. You will be given a copy for your records as well.

Signature(s) for Consent:

_____ Yes_____ No I give permission to join the research project entitled, *Yoga for Service Members and Veterans.*

Please initial next to either "Yes" or "No" to the following:

_____ Yes _____ No I consent to be audio-recorded for the interview portion of this research.

_____ Yes _____ No I give permission to allow the investigator to use a pseudonym (or fake name) in publications from this research

Name of Participant (Print): _____

Participant's Signature: _____

Signature of the Person Obtaining Consent: _____

Date: _____

APPENDIX B

Consent to Participate in Interview Research Project:

My name is Robin E. Cushing. I am a graduate student at the University of Hawai`i at Manoa in the Office of Public Health Studies. As part of the requirements for earning my graduate degree, I am doing a research project as a requirement for earning my graduate degree. The purpose of my project is to evaluate how yoga can help service members and veterans with post-traumatic stress disorder (PTSD). I am asking you to participate because you can help me evaluate yoga in the military population.

Activities and Time Commitment: If you participate in this project, I will meet with you for an interview at a location and time convenient for you. The interview will consist of 15 open ended questions. It will take 30-45 minutes. Interview questions will include questions like, "What do you think are benefits of yoga? What do you think are reasons why some service members or Veterans do not participate in yoga?" Only you and I will be present during the interview. I will audio-record the interview so that I can later transcribe the interview and analyze the responses. You will be one of about 10 people whom I will interview for this study.

Benefits and Risks: There will be no direct benefit to you for participating in this interview. The results of this project may help find out if yoga would be beneficial and acceptable to service members with PTSD. I believe there is little risk to you in participating in this research project. You may become stressed or uncomfortable answering any of the interview questions or discussing topics with me during the interview. If you do become stressed or uncomfortable, you can skip the question or take a break. You can also stop the interview or you can withdraw from the project altogether.

Privacy and Confidentiality: I will keep all information in a safe place. Only my University of Hawai`i advisor and I will have access to the information. The University of Hawai`i Human Studies Program has the right to review research records for this study. After I prepare a written copy of the interviews and am finished with the study, I will erase or destroy the audio-recordings. I will remove any personally identifiable information from the transcripts at the time they will be written. When I report the results of my research project, I will not use your name. I will not use any other personal identifying information that can identify you. I will use pseudonyms (fake names) and report my findings in a way that protects your privacy and confidentiality to the extent allowed by law.

Voluntary Participation: Your participation in this project is completely voluntary. You may stop participating at any time. If you stop being in the study, there will be no penalty or loss to you. Your choice to participate or not participate will not affect your rights to services available to you through the US Military.

You will receive a $5 gift certificate to either Starbucks or Jamba Juice for your time and effort in participating in this research project.
Questions: If you have any questions about this study, please call or email me at {253-241-6526 and robinecushing@gmail.com]. You may also contact my adviser, Dr. Kathryn Braun at kbraun@hawaii.edu. If you have questions about your rights as a research participant, you may contact the UH Human Studies Program at 808-956-5007 or uhirb@hawaii.edu.

If you agree to participate in this project, please sign and date this signature page.

If you consent to be in this project, please sign the signature section below and return it to Robin Cushing. You will be given a copy for your records as well.

Signature(s) for Consent:

_____ Yes_____ No I give permission to join the research project entitled, *Yoga for Service Members and Veterans.*

Please initial next to either "Yes" or "No" to the following:

_____ Yes _____ No I consent to be audio-recorded for the interview portion of this research.

_____ Yes _____ No I give permission to allow the investigator to use a pseudonym (or fake name) in publications from this research

Name of Participant (Print): _____

Participant's Signature: _____

Signature of the Person Obtaining Consent: _____

Date: _____

APPENDIX C

Screening Form for Yoga Research

Thank you for coming to the yoga sessions. I need to ask you a few questions in order to determine whether you may be eligible for the research. I will ask you about deployment history, and current mental health treatment.

This research is looking to see if yoga can help decrease PTSD symptoms, depression, anxiety, and insomnia. If you are eligible in order to complete the intervention you must complete 5 out of 7 yoga sessions.

Would you like to continue with the screening? This should take less than 5 minutes long? If you feel uncomfortable answering questions about anything, you can stop at any time. You can continue with the yoga even if you do not want to partake in this study.

Your answers will be confidential. No one will know the answers except for the research team at University of Hawai`i.

1) Are you older than 18 years of age?

2) Have you served in one of the current operations in the Middle East (OIF/OEF/OND)?

3) Are your PTSD symptoms related to combat tour from your military service?

4) Females only, are you currently pregnant?

5) Are you capable of physically and mentally practicing a yoga class?

    a. If you do not know if you are capable of completing yoga are you able to walk or bike 2 miles and complete 5 pushups on your knees?

Do you have any questions about the screening or research? If you are qualified to participate in the study, there will be further documents/surveys to fill out. Again you can quit at any time during this process.

Thank you again for your willingness to answer these questions.

APPENDIX D

PCL-M

INSTRUCTIONS: Below is a list of problems and complaints that veterans sometimes have in response to stressful military experiences. Please read each one carefully, then circle one of the numbers to the right to indicate how much you have been bothered by that problem in the past month.

		Not at all	A little bit	Moderately	Quite a bit	Extremely
1.	Repeated, disturbing *memories, thoughts,* or *images* of a stressful military experience?	1	2	3	4	5
2.	Repeated, disturbing *dreams* of a stressful military experience?	1	2	3	4	5
3.	Suddenly *acting* or *feeling* as if a stressful military experience *were happening again* (as if you were reliving it)?	1	2	3	4	5
4.	Feeling *very upset* when *something reminded you* of a stressful military experience?	1	2	3	4	5
5.	Having *physical reactions* (e.g., heart pounding, trouble breathing, sweating) when *something reminded you* of a stressful military experience?	1	2	3	4	5
6.	Avoiding *thinking about* or *talking about* a stressful military experience or avoiding *having feelings* related to it?	1	2	3	4	5
7.	Avoiding *activities* or *situations* because *they reminded you* of a stressful military experience?	1	2	3	4	5
8.	Trouble *remembering important parts* of a stressful military experience?	1	2	3	4	5
9.	*Loss of interest* in activities that you used to enjoy?	1	2	3	4	5
10.	Feeling *distant* or *cut off* from other people?	1	2	3	4	5
11.	Feeling *emotionally numb* or being unable to have loving feelings for those close to you?	1	2	3	4	5
12.	Feeling as if your *future* will somehow be *cut short*?	1	2	3	4	5
13.	Trouble *falling* or *staying asleep*?	1	2	3	4	5
14.	Feeling *irritable* or having *angry outbursts*?	1	2	3	4	5
15.	Having *difficulty concentrating*?	1	2	3	4	5
16.	Being "*super-alert*" or watchful or on guard?	1	2	3	4	5
17.	Feeling *jumpy* or easily startled?	1	2	3	4	5

PCL-M for DSM-IV (11/1/94) Weathers, Litz, Huska, & Keane National Center for PTSD - Behavioral Science Division

Beck Anxiety Inventory

Below is a list of common symptoms of anxiety. Please carefully read each item in the list. Indicate how much you have been bothered by that symptom during the past month, including today, by circling the number in the corresponding space in the column next to each symptom.

	Not At All	Mildly but it didn't bother me much.	Moderately - it wasn't pleasant at times	Severely – it bothered me a lot
Numbness or tingling	0	1	2	3
Feeling hot	0	1	2	3
Wobbliness in legs	0	1	2	3
Unable to relax	0	1	2	3
Fear of worst happening	0	1	2	3
Dizzy or lightheaded	0	1	2	3
Heart pounding/racing	0	1	2	3
Unsteady	0	1	2	3
Terrified or afraid	0	1	2	3
Nervous	0	1	2	3
Feeling of choking	0	1	2	3
Hands trembling	0	1	2	3
Shaky / unsteady	0	1	2	3
Fear of losing control	0	1	2	3
Difficulty in breathing	0	1	2	3
Fear of dying	0	1	2	3
Scared	0	1	2	3
Indigestion	0	1	2	3
Faint / lightheaded	0	1	2	3
Face flushed	0	1	2	3
Hot/cold sweats	0	1	2	3
Column Sum				

Scoring **-** Sum each column. Then sum the column totals to achieve a grand score. Write that score here _____ .

Interpretation

A grand sum between **0 – 21** indicates very low anxiety. That is usually a good thing. However, it is possible that you might be unrealistic in either your assessment which would be denial or that you have learned to "mask" the symptoms commonly associated with anxiety. Too little "anxiety" could indicate that you are detached from yourself, others, or your environment.

A grand sum between **22 – 35** indicates moderate anxiety. Your body is trying to tell you something. Look for patterns as to when and why you experience the symptoms described above. For example, if it occurs prior to public speaking and your job requires a lot of presentations you may want to find ways to calm yourself before speaking or let others do some of the presentations. You may have some conflict issues that need to be resolved. Clearly, it is not "panic" time but you want to find ways to manage the stress you feel.

A grand sum that **exceeds 36** is a potential cause for concern. Again, look for patterns or times when you tend to feel the symptoms you have circled. Persistent and high anxiety is not a sign of personal weakness or failure. It is, however, something that needs to be proactively treated or there could be significant impacts to you mentally and physically. You may want to consult a counselor if the feelings persist.

Personal Health Questionnaire Depression Scale (PHQ-8)

Over the **last 2 weeks**, how often have you been bothered by any of the following problems?
*(circle **one** number on each line)*

How often during the past 2 weeks were you bothered by...	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself, or that you are a failure, or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3

Scoring

If two consecutive numbers are circled, score the higher (more distress) number. If the numbers are not consecutive, do not score the item. Score is the sum of the 8 items. If more than 1 item missing, set the value of the scale to missing. A score of 10 or greater is considered major depression, 20 or more is severe major depression.

Characteristics

Tested on 1165 subjects with chronic conditions.

No. of items	Observed Range	Mean	Standard Deviation	Internal Consistency Reliability	Test-Retest Reliability
8	0-24	6.63	5.52	.86	NA

Source of Psychometric Data

U.S. National Chronic Disease Self-Management Study. Study described in Ory MG, Ahn S, Jiang L, et al. National study of chronic disease self-management: six month outcome findings. Journal of Aging and Health. 2013 [in press].

Comments

This is an adaptation of the PHQ-9 scale. Since this scale is self-administered in our studies, question #9, "How often during the past 2 weeks were you bothered by thoughts that you would be better off dead, or of hurting yourself in some way?", was deleted. This scale available in Spanish.

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Mindful Attention Awareness Scale (MAAS), trait version

Characteristics of the scale:

The trait MAAS is a 15-item scale designed to assess a core characteristic of mindfulness, namely, a receptive state of mind in which attention, informed by a sensitive awareness of what is occurring in the present, simply observes what is taking place. This is in contrast to the conceptually driven mode of processing, in which events and experiences are filtered through cognitive appraisals, evaluations, memories, beliefs, and other forms of cognitive manipulation. Across many studies conducted since 2003, the trait MAAS has shown excellent psychometric properties. Factor analyses with undergraduate, community and nationally sampled adult, and adult cancer populations have confirmed a single factor scale structure (Brown & Ryan, 2003; Carlson & Brown, 2005). Internal consistency levels (Cronbach's alphas) generally range from .80 to .90. The MAAS has demonstrated high test-retest reliability, discriminant and convergent validity, known-groups validity, and criterion validity. Correlational, quasi-experimental, and experimental studies have show that the trait MAAS taps a unique quality of consciousness that is related to, and predictive of, a variety of emotion regulation, behavior regulation, interpersonal, and well-being phenomena. The measure takes 5 minutes or less to complete. A validated, 5-item state version of the MAAS is also available in Brown and Ryan (2003) or upon request.

MAAS norms to date:

Normative information on the trait MAAS is available for both community adults and college students, as follows:

Community adults (4 independent samples): $N = 436$; MAAS $M = 4.20$, $SD = .69$.

College students (14 independent samples): $N = 2277$; MAAS $M = 3.83$, $SD = .70$.

Appropriate validity references for the trait MAAS:

Brown, K.W. & Ryan, R.M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84,* 822-848.

Carlson, L.E. & Brown, K.W. (2005). Validation of the Mindful Attention Awareness Scale in a cancer population. *Journal of Psychosomatic Research, 58,* 29-33.

Day-to-Day Experiences

Instructions: Below is a collection of statements about your everyday experience. Using the 1-6 scale below, please indicate how frequently or infrequently you currently have each experience. Please answer according to what *really reflects* your experience rather than what you think your experience should be. Please treat each item separately from every other item.

1	2	3	4	5	6
Almost Always	Very Frequently	Somewhat Frequently	Somewhat Infrequently	Very Infrequently	Almost Never

I could be experiencing some emotion and not be conscious of it until some time later.	1	2	3	4	5	6
I break or spill things because of carelessness, not paying attention, or thinking of something else.	1	2	3	4	5	6
I find it difficult to stay focused on what's happening in the present.	1	2	3	4	5	6
I tend to walk quickly to get where I'm going without paying attention to what I experience along the way.	1	2	3	4	5	6
I tend not to notice feelings of physical tension or discomfort until they really grab my attention.	1	2	3	4	5	6
I forget a person's name almost as soon as I've been told it for the first time.	1	2	3	4	5	6
It seems I am "running on automatic," without much awareness of what I'm doing.	1	2	3	4	5	6
I rush through activities without being really attentive to them.	1	2	3	4	5	6
I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there.	1	2	3	4	5	6
I do jobs or tasks automatically, without being aware of what I'm doing.	1	2	3	4	5	6
I find myself listening to someone with one ear, doing something else at the same time.	1	2	3	4	5	6

1 Almost Always	2 Very Frequently	3 Somewhat Frequently	4 Somewhat Infrequently	5 Very Infrequently	6 Almost Never

I drive places on 'automatic pilot' and then wonder why I went there.	1	2	3	4	5	6
I find myself preoccupied with the future or the past.	1	2	3	4	5	6
I find myself doing things without paying attention.	1	2	3	4	5	6
I snack without being aware that I'm eating.	1	2	3	4	5	6

Name_____ Date_____

Sleep Quality Assessment (PSQI)

What is PSQI, and what is it measuring?

The Pittsburgh Sleep Quality Index (PSQI) is an effective instrument used to measure the quality and patterns of sleep in adults. It differentiates "poor" from "good" sleep quality by measuring seven areas (components): subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction over the last month.

INSTRUCTIONS:

The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

During the past month,

1. When have you usually gone to bed? _____
2. How long (in minutes) has it taken you to fall asleep each night? _____
3. What time have you usually gotten up in the morning? _____
4. A. How many hours of actual sleep did you get at night? _____
   B. How many hours were you in bed? _____

5. During the past month, how often have you had trouble sleeping because you	Not during the past month (0)	Less than once a week (1)	Once or twice a week (2)	Three or more times a week (3)
A. Cannot get to sleep within 30 minutes				
B. Wake up in the middle of the night or early morning				
C. Have to get up to use the bathroom				
D. Cannot breathe comfortably				
E. Cough or snore loudly				
F. Feel too cold				
G. Feel too hot				
H. Have bad dreams				
I. Have pain				
J. Other reason (s), please describe, including how often you have had trouble sleeping because of this reason (s):				
6. During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?				
7. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?				
8. During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?				
9. During the past month, how would you rate your sleep quality overall?	Very good (0)	Fairly good (1)	Fairly bad (2)	Very bad (3)

Scoring

Component 1	#9 Score	C1 _____
Component 2	#2 Score (<15min (0), 16-30min (1), 31-60 min (2), >60min (3)) + #5a Score (if sum is equal 0=0; 1-2=1; 3-4=2; 5-6=3)	C2 _____
Component 3	#4 Score (>7(0), 6-7 (1), 5-6 (2), <5 (3)	C3 _____
Component 4	(total # of hours asleep) / (total # of hours in bed) x 100 >85%=0, 75%-84%=!, 65%-74%=2, <65%=3	C4 _____
Component 5	# sum of scores 5b to 5j (0=0; 1-9=1; 10-18=2; 19-27=3)	C5 _____
Component 6	#6 Score	C6 _____
Component 7	#7 Score + #8 score (0=0; 1-2=1; 3-4=2; 5-6=3)	C7 _____

Add the seven component scores together _____ *Global PSQI* _____

A total score of "5" or greater is indicative of poor sleep quality.
If you scored "5" or more it is suggested that you discuss your sleep habits with a healthcare provider

APPENDIX E

UNIVERSITY of HAWAI'I SYSTEM

Office of Research Compliance
Human Studies Program

MEMORANDUM

July 8, 2016

TO: Robin Cushing
Kathryn Braun
Principal Investigators
Office of Public Health Studies

FROM: Denise A. Lin-DeShetler, MPH, MA
Director

SUBJECT: 24025 - "Yoga for Service Members and Veterans with PTSD"

This is to acknowledge receipt of your response dated June 16, 2016 to the stipulations issued by the Human Studies Program during its review of the project identified above at its meeting on May 20, 2016. The information you provided satisfactorily addressed the Human Studies Program stipulations, and the project is approved for one year, effective July 8, 2016.

This memorandum is your record of the Human Studies Program approval of this study. Please maintain it with your study records.

The Human Studies Program approval for this project will expire on July 7, 2017. If you expect your project to continue beyond this date, you must submit an application for renewal of this Human Studies Program approval. The Human Studies Program approval must be maintained for the entire term of your project.

If, during the course of your project, you intend to make changes to this study, you must obtain approval from the Human Studies Program prior to implementing any changes. If an Unanticipated Problem occurs during the course of the study, you must notify the Human Studies Program within 24 hours of knowledge of the problem. A formal report must be submitted to the Human Studies Program within 10 days. The definition of "Unanticipated Problem" may be found at: https://manoa.hawaii.edu/researchcompliance/policies-guidance, and the report form may be downloaded here: https://manoa.hawaii.edu/researchcompliance/report-protocol-violation-or-unanticipated-problem.

You are required to maintain complete records pertaining to the use of humans as participants in your research. This includes all information or materials conveyed to and received from participants as well as signed consent forms, data, analyses, and results. These records must be maintained for at least three years following project completion or termination, and they are subject to inspection and review by the Human Studies Program and other authorized agencies.

1960 East-West Road
Biomedical Sciences Building B104
Honolulu, Hawai'i 96822
Telephone: (808) 956-5007
Fax: (808) 956-8683

Please notify this office when your project is completed. Upon notification, we will close our files pertaining to your project. Reactivation of the Human Studies Program approval will require a new Human Studies Program application.

Please contact this office if you have any questions or require assistance. We appreciate your cooperation, and wish you success with your research.

Office of Research Compliance
Human Studies Program

UNIVERSITY of HAWAI'I SYSTEM

MEMORANDUM

January 18, 2017

TO: Robin Cushing
Kathryn Braun, Ph.D.
Principal Investigators
Public Health Studies

FROM: Denise A. Lin-DeShetler, MPH, MA
Director

SUBJECT: CHS #24025 – "Yoga for Service Members and Veterans with PTSD"

Your application for the Human Studies Program approval of a proposed change for the study identified above was approved by the Human Studies Program on December 23, 2016. The approved changes were for the Qualitative study: revised consent form , demographic questions and the increase of sample size to 20 . This application qualified for Expedited Review under CFR 46.110 and 21 CFR 56.110, Category (b). Note that this approval date is for the proposed revision, and does not reset the annual study expiration date. Please refer back to your most recent IRB approval letter (initial application or continuing review) for the study's expiration date. Regulations require that continuing review be conducted on or before the one-year anniversary date of IRB approval.

If future revisions to your study are required, please seek the Human Studies Program approval prior to their implementation. If a change is necessary to protect the safety or welfare of study participants, it is permissible to make the change without prior approval. However, you must notify the Human Studies Program as soon as possible, requesting approval for the change.

When seeking approval to modify a Human Studies Program-approved document, please submit the document using "Track Changes" to identify the proposed modifications. Clearly explain the reason for the change on the Human Studies Modification form.

Please contact the Human Studies Program office at 956-5007 if you have any questions or require assistance.

2425 Campus Road, Sinclair 10
Honolulu, Hawai'i 96822
Telephone: (808) 956-5007 • Fax: (808) 956-9150

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